The Complete Blood Count

Someone ordered it;
the results are back;
now what do you do…

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Disclosures

- *I have nothing to disclose*
- *I have no financial ties to industry*
- *My only financial ties are to several colleges over the next 4 years (can you believe some colleges are now $60+K per year)*
- *These views are solely those of the presenter and are not meant to represent the DoD, the Air Force or my Mother…*

Goals of the talk

- Describe utility and limitations of CBC
- Describe common abnormalities
- Workup (next step) of abnormalities
- Who to refer
- Who to refer right this second
- Who needs a bone marrow biopsy

Why do patients get CBCs?

- Routine health screening
- General symptoms
  - Fatigue, fevers, malaise, just not feeling right
- Monitoring drug toxicities
  - Chemo, anti-rheumatics, anticoagulants
- Infections
  - Checking WBC
- Bleeding/Clotting
  - Checking platelets, red cells
- Or, sometimes for no good reason…

Standard Components of the CBC

WBC	
RBC	
HGB	
HCT	
PLT	
MCV	
RDW	
MCH	
MCHC	
MPV	
Diff	

Components of the CBC

WBC	Number of white blood cells, pretty straight forward
RBC	Number of red blood cells. Not the number we usually discuss
HGB	Hemoglobin level. A standard for defining anemia
HCT	Hematocrit. The other standard for defining anemia
PLT	Number of platelets. Pretty straight forward
MCV	Mean Corpuscular Volume
RDW	Red Cell Distribution Width
MCH	Mean Corpuscular Hemoglobin
MCHC	Mean Corpuscular Hemoglobin concentration
MPV	Mean Platelet Volume
Diff	Differential of White blood cells

WBC
Common abnormalities

- Normal range about 4 – 11 K
- Mild (isolated) Leukopenia: 2-4K
  - Often benign, ethnic variant
  - Think liver disease, alcohol
  - < 2 usually needs a marrow → rapid referral
- Mild isolated Leukocytosis 11-18K
  - Often benign, steroids, smoking, infection
  - > 18K in the absence of infection think primary blood disorder → referral

RBC

- Normal about 5 (million)
- Typically follows H/H
  - RBC is low in most anemias 4 or less
  - RBC is high in polycythemia 6 or more

- One important exception
  - A high RBC count with anemia =

RBC

- Normal about 5 (million)
- Typically follows H/H
  - RBC is low in most anemias
  - RBC is high in polycythemia

- One important exception
  - A high RBC count with anemia = Thalassemia

HGB/HCT

- Defines amount red blood in blood
- Typically in 1:3 ratio to each other
- Used to define anemia
  - H/H < 12/36 in women
  - H/H < 14/41 in men

- Why the difference between men and women?
- Most medical students tell me menstruation…
  - Could that be right?

Testosterone

- Causes men to have larger muscle mass
- causes men to have a larger blood mass
- Mild isolated anemia in older men is often due to hypogonadism (Low “T” on the radio)
- If you give a women testosterone, her hemoglobin will go up.
- If you snip/snip a man, his hemoglobin will go down

Testosterone

- Causes men to have larger muscle mass
- Causes men to have a larger blood mass
- Mild isolated anemia in older men is often due to hypogonadism

- Incidentally, testosterone also causes men to:
  - Smell more
  - Drink milk directly out of the carton
  - Leave to toilet seat up… among other bad habits

PLT

- Normal range typically about 150 – 400
- But… platelets in 100 – 150 range often clinically insignificant (or normal or alcohol or liver disease)
- Isolated thrombocytopenia less than 100
  - < 60 year old usually ITP or liver disease
  - > 60 year old → need a marrow for Myelodysplasia (sick marrow disease, pre-leukemia)
- Bleeding risk goes up markedly < 20 → refer now
- Spontaneous bleeding <10 → transfuse and refer

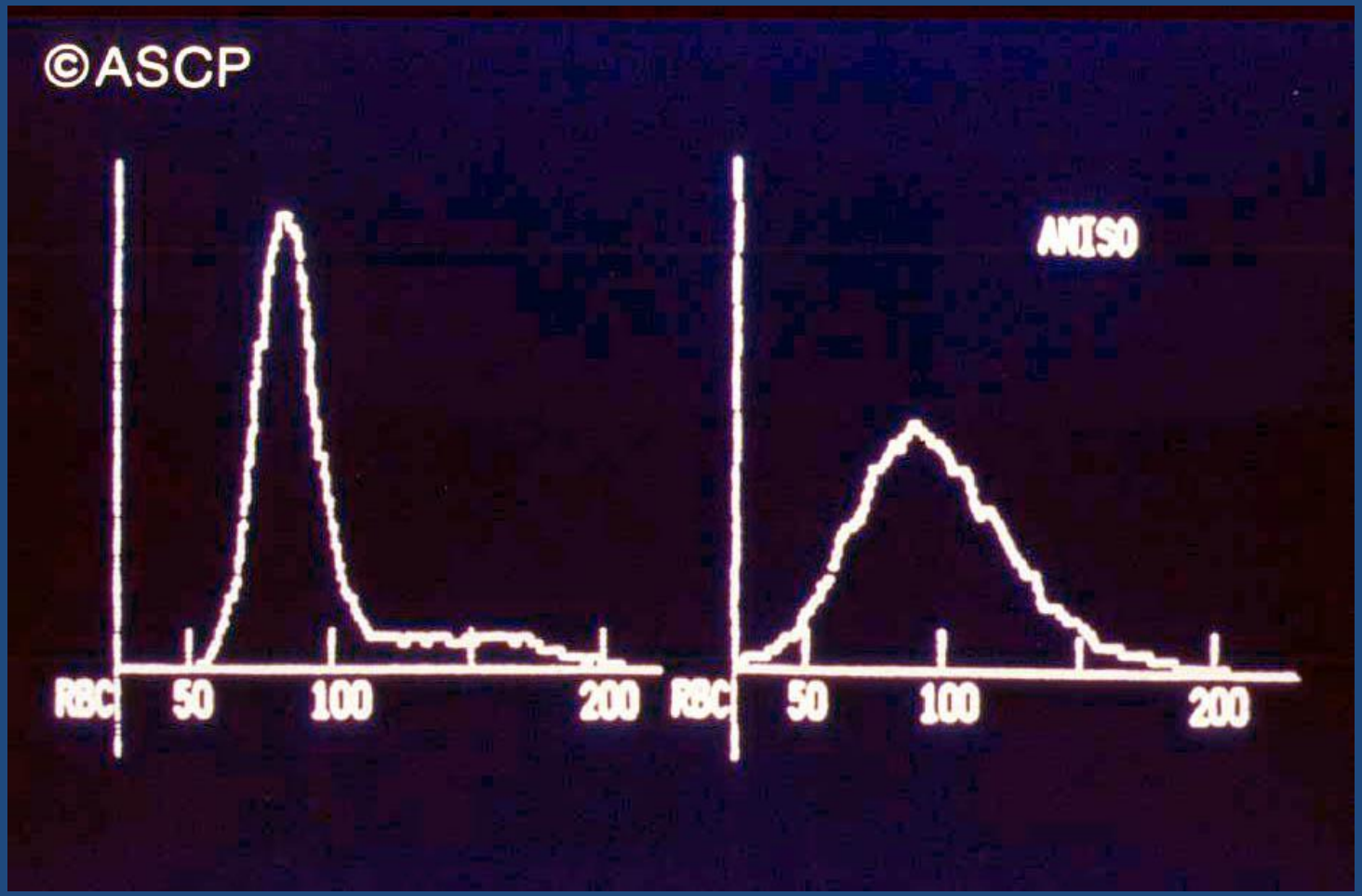
MCV
Mean Corpuscular Volume
Very useful in anemia workup

< 80 Microcytic	80 – 99 Normocytic	>100 Macrocytic
Iron deficiency	Renal disease	B 12 def
Thalassemia	Early iron def.	Folate def
Sideroblastic	Hypogonadism	Liver dz
Anemia of chronic dz		Myelodysplasia
Hgb-opathies	Hypothyroidism	
	Alcohol over-supplementation	

RDW

- Red Cell Distribution Width…
- Normal about 12-14
- Gives a sense of size variability in red cells or anisocytosis
- Elevated RDW may be an early sign of Iron deficiency

RDW



MCH

- Mean Corpuscular Hemoglobin
- In 25 years, I haven't found a use for it.
  - Low MCH typically correlates with low MCV in iron deficiency anemia.
- I generally ignore it.
- You should too.

MCHC

- Mean Corpuscular Hemoglobin Concentration

- Calculated by dividing Hgb by the HCT
- Typically 32-36 gm/dL
- Usually totally ignorable… UNLESS…

MCHC

- Mean Corpuscular Hemoglobin Concentration

- Calculated by dividing Hgb by the HCT
- Typically 32-36 gm/dL
- Usually totally ignorable…
- Unless it's high, > 37 → then think Hereditary spherocytosis or hemagglutinins

MPV

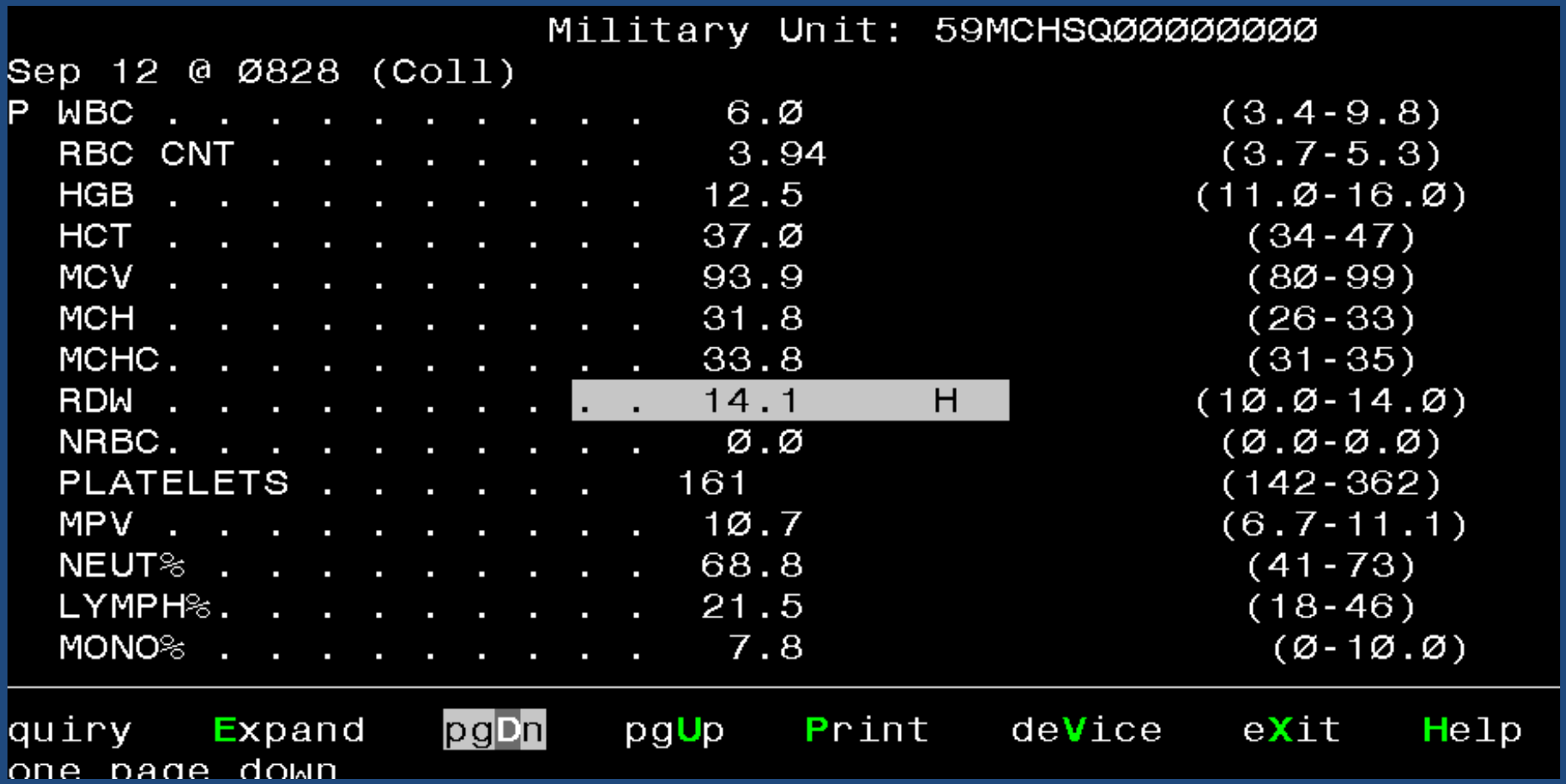
- Mean Platelet volume
- Typically about 7 – 11

- If MPV is high in a patient with low platelets
  - → think platelet destruction: ITP
  - Or myeloproliferative disease
  - Or congenital macrothrombocytopenia
  - Or Bernard Soulier syndrome
  - Or better yet, just think ITP

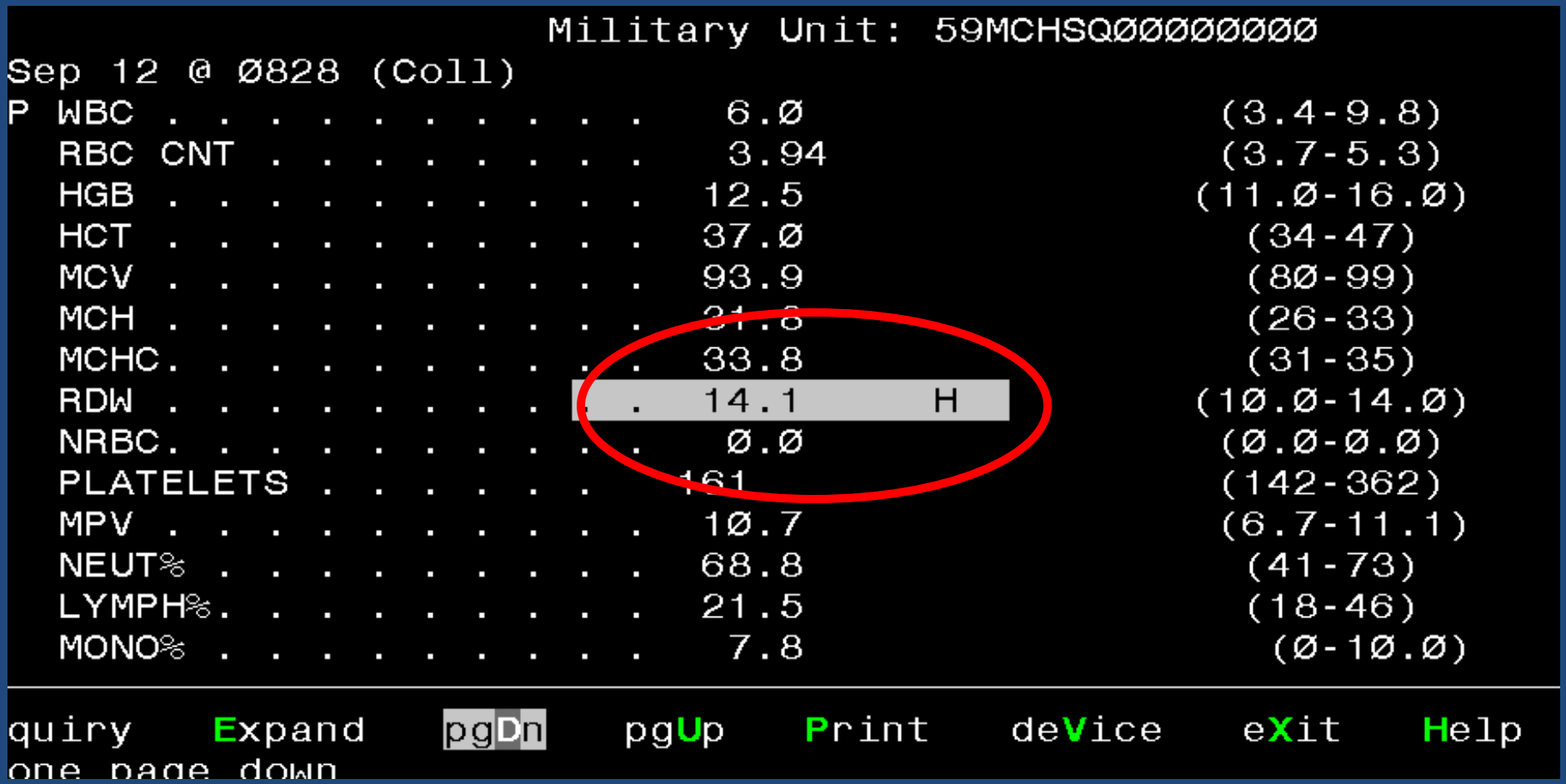
Let’s look at CHCS

Some recent CBC referrals to our hematology clinic at SAMMC

37 year old woman, fatigue



Elevated RDW



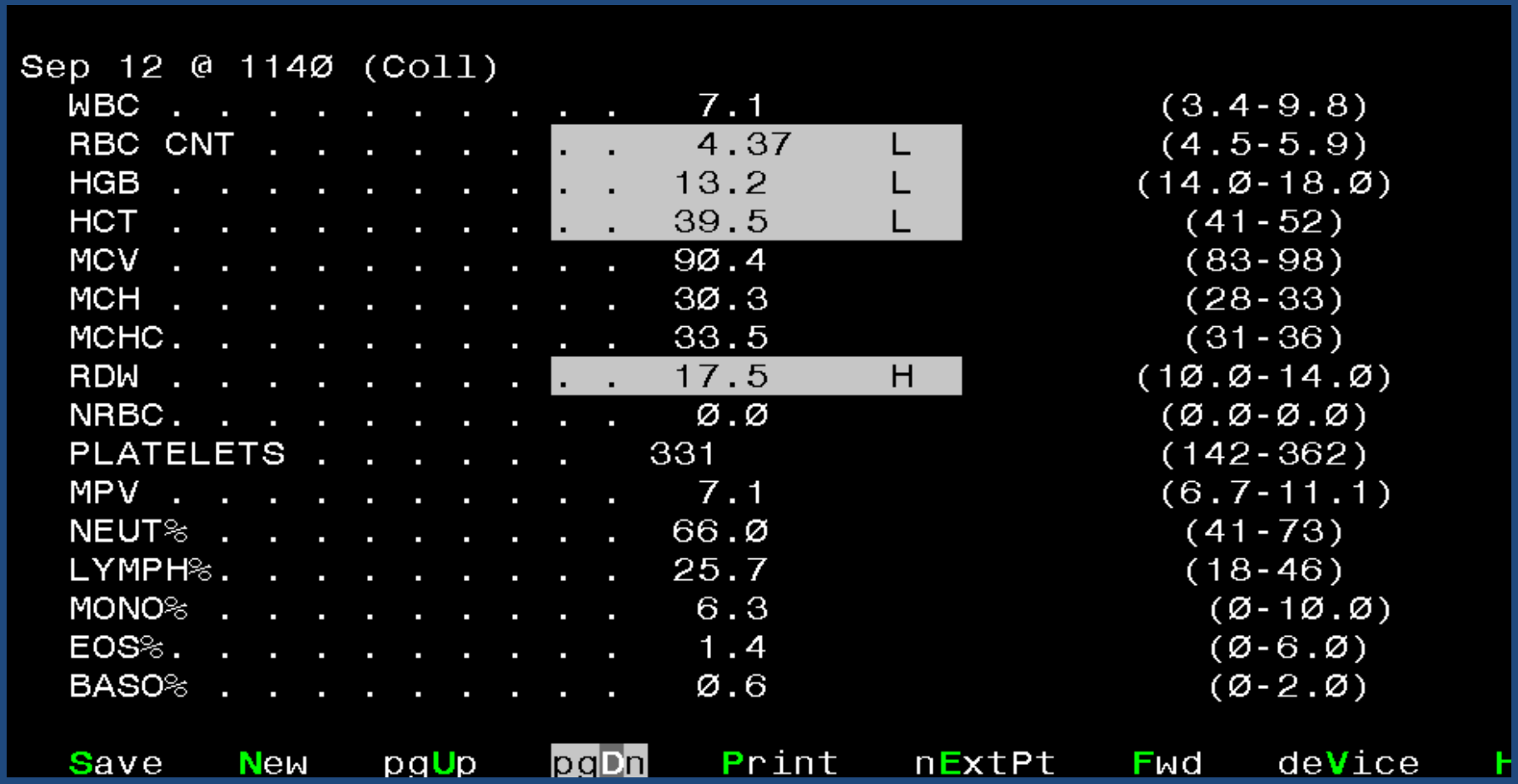
High RDW → Think iron deficiency

- Her ferritin was 5

- She wasn't anemic yet, but iron is also needed for muscles
- She's likely going to menstruate for another ten or so years…

- Replace iron before getting anemic

45 year old man, fatigued



Sep 12 @ 1140 (Coll)

WBC	7.1		(3.4-9.8)
RBC CNT	4.37	L	(4.5-5.9)
HGB	13.2	L	(14.0-18.0)
HCT	39.5	L	(41-52)
MCV	90.4		(83-98)
MCH	30.3		(28-33)
MCHC	33.5		(31-36)
RDW	17.5	H	(10.0-14.0)
NRBC	0.0		(0.0-0.0)
PLATELETS	331		(142-362)
MPV	7.1		(6.7-11.1)
NEUT%	66.0		(41-73)
LYMPH%	25.7		(18-46)
MONO%	6.3		(0-10.0)
EOS%	1.4		(0-6.0)
BASO%	0.6		(0-2.0)

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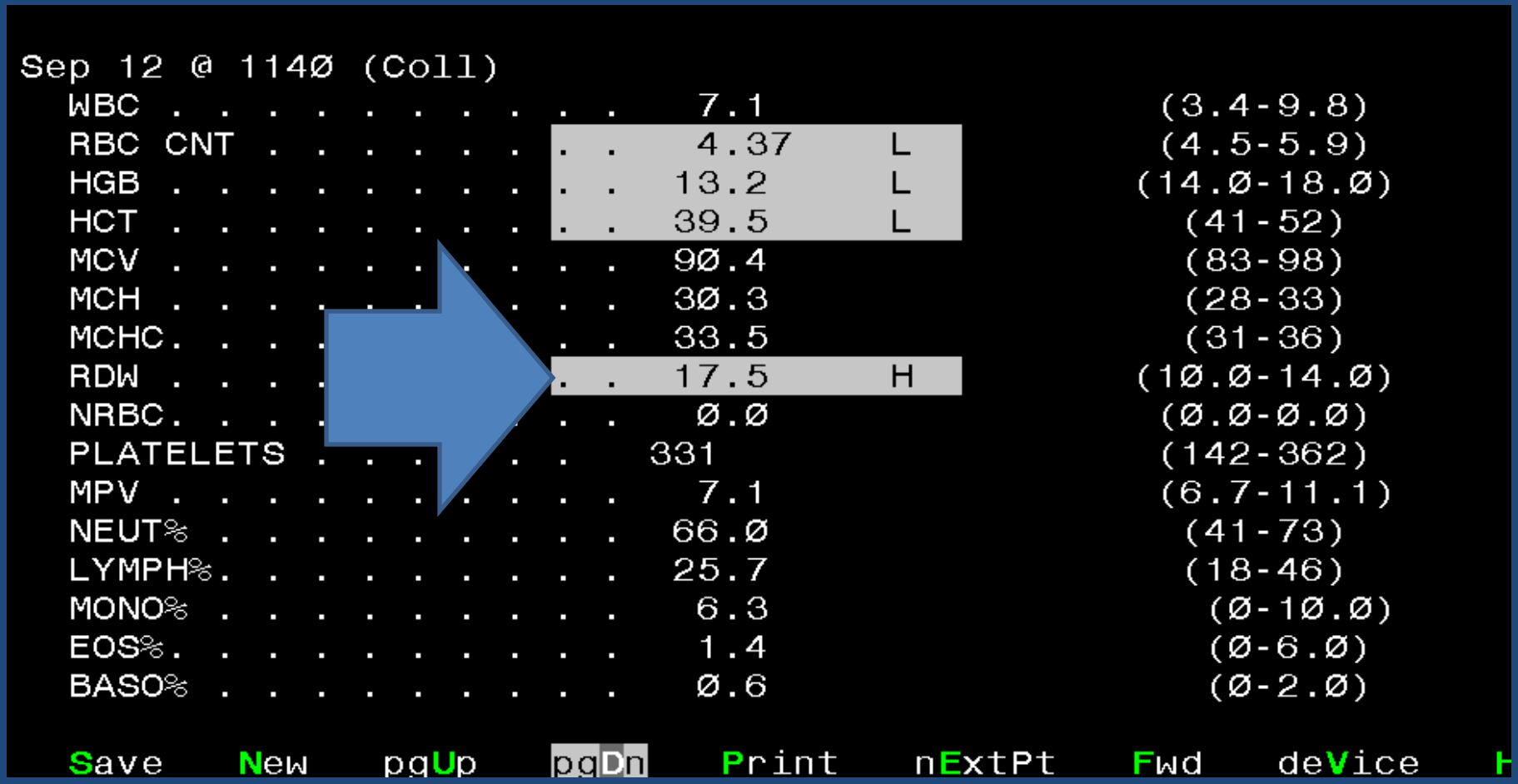
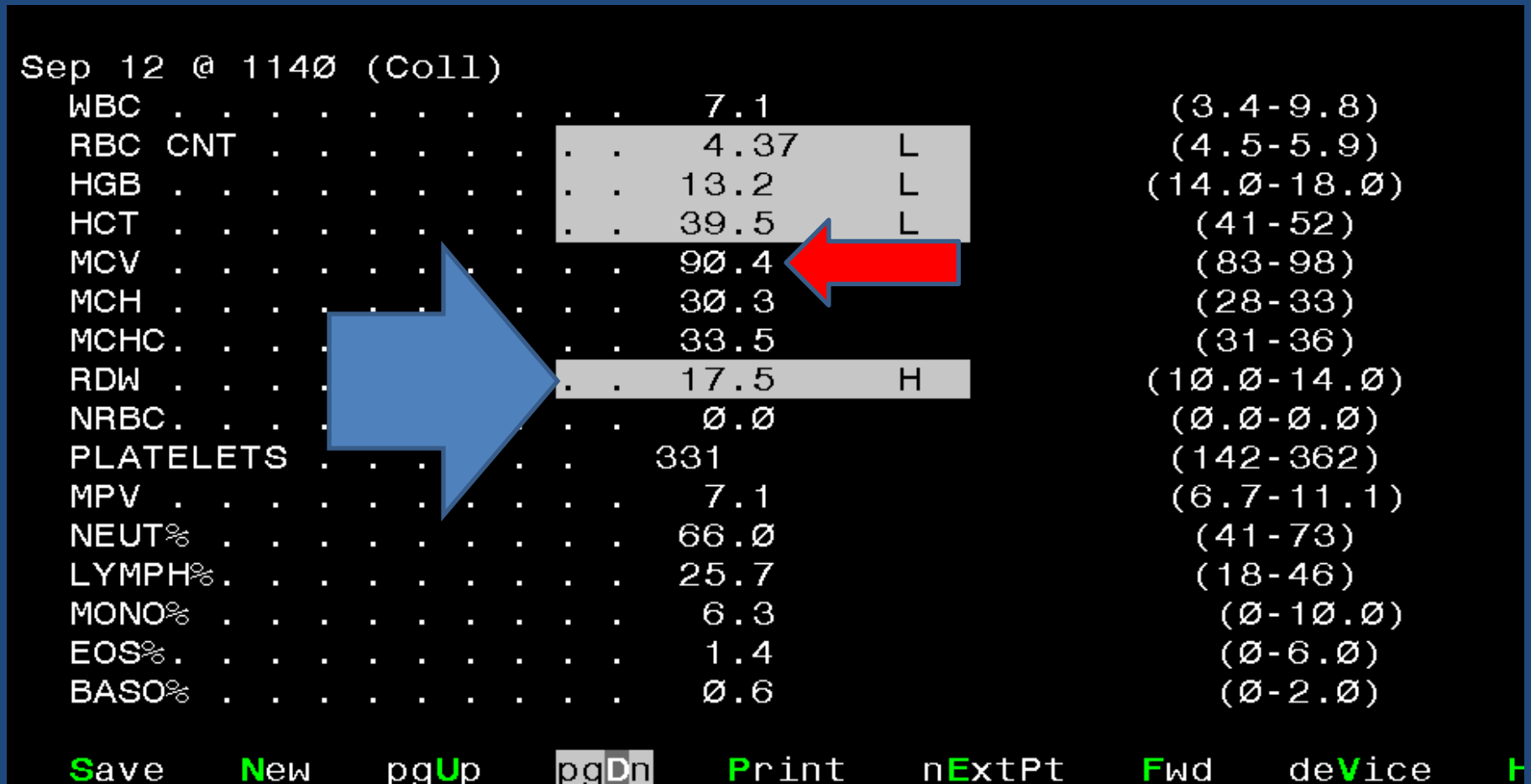
Mild anemia, even higher RDW



Again *iron deficiency*

Note that the MCV hasn't started dropping yet



Same iron deficient patient untreated a month later

WBC	8.9		(3.4-9.8)
RBC CNT	3.79	L	(4.5-5.9)
HGB	10.0	L	(14.0-18.0)
HCT	31.1	L	(41-52)
MCV	82.1	L	(83-98)
MCHC	34.0		(31-36)
RDW	14.0		(10.0-14.0)
PLATELETS	425	H	(142-362)
MPV	7.9		(6.7-11.1)

Now, more anemic,
MCV down
RDW normalizing
Platelets starting to rise

All consistent with worsening iron deficiency

WBC	8.9		(3.4-9.8)
RBC CNT	3.79	L	(4.5-5.9)
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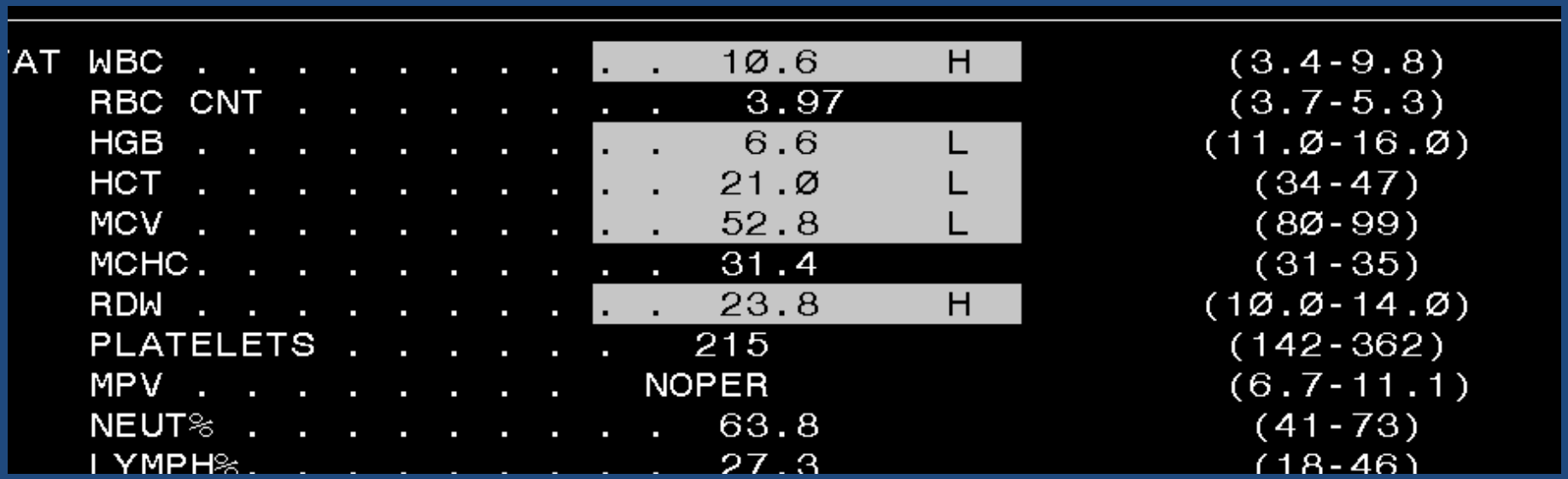
MCV	82.1	L	(83-98)
MCHC	34.0		(31-36)
RDW	14.0		(10.0-14.0)
PLATELETS	425	H	(142-362)
MPV	7.9		(6.7-11.1)

Another young tired woman

AT	WBC	10.6	H	(3.4-9.8)
	RBC CNT	3.97		(3.7-5.3)
	HGB	6.6	L	(11.0-16.0)
	HCT	21.0	L	(34-47)
	MCV	52.8	L	(80-99)
	MCHC	31.4		(31-35)
	RDW	23.8	H	(10.0-14.0)
	PLATELETS	215		(142-362)
	MPV	NOPER		(6.7-11.1)

Severe anemia
Very, very low MCV
High RDW
Think? _____



AT	WBC	10.6 H	(3.4-9.8)
	RBC CNT	3.97	(3.7-5.3)
	HGB	6.6 L	(11.0-16.0)
	HCT	21.0 L	(34-47)
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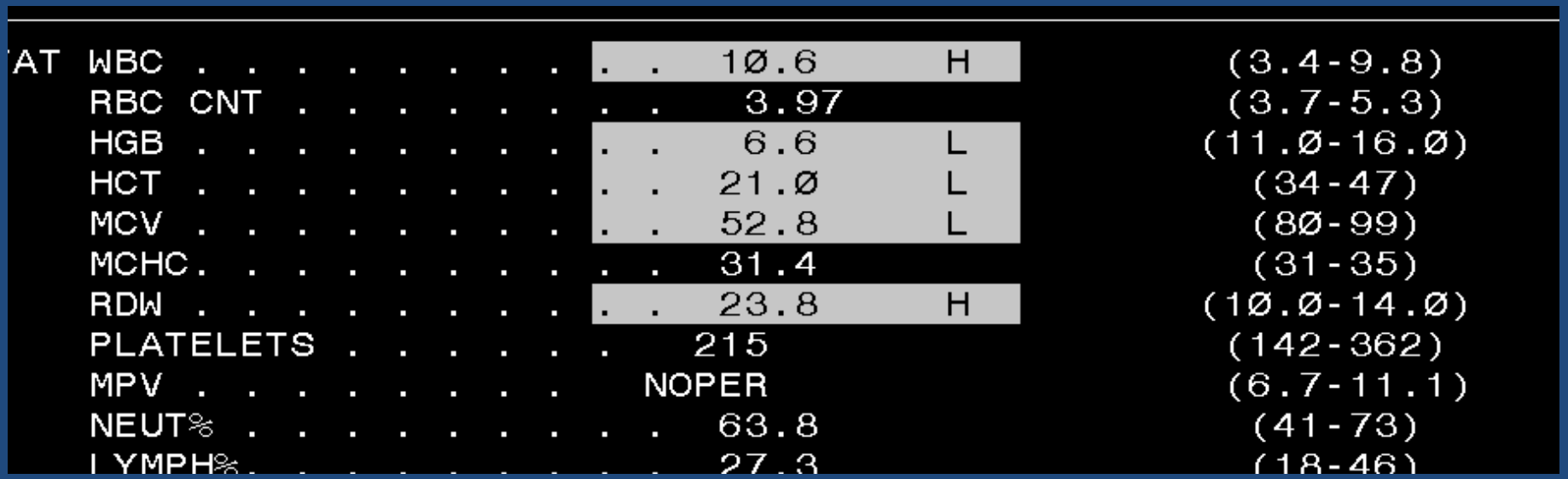
	PLATELETS	215	(142-362)
	MPV	NOPER	(6.7-11.1)
	NEUT%	63.8	(41-73)
	LYMPH%	27.3	(18-46)

Severe anemia
Very, very low MCV
High RDW
Iron deficiency



AT	WBC	10.6 H	(3.4-9.8)
	RBC CNT	3.97	(3.7-5.3)
	HGB	6.6 L	(11.0-16.0)
	HCT	21.0 L	(34-47)
	MCV	52.8 L	(80-99)
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	RDW	23.8 H	(10.0-14.0)
	PLATELETS	215	(142-362)
	MPV	NOPER	(6.7-11.1)
	NEUT%	63.8	(41-73)
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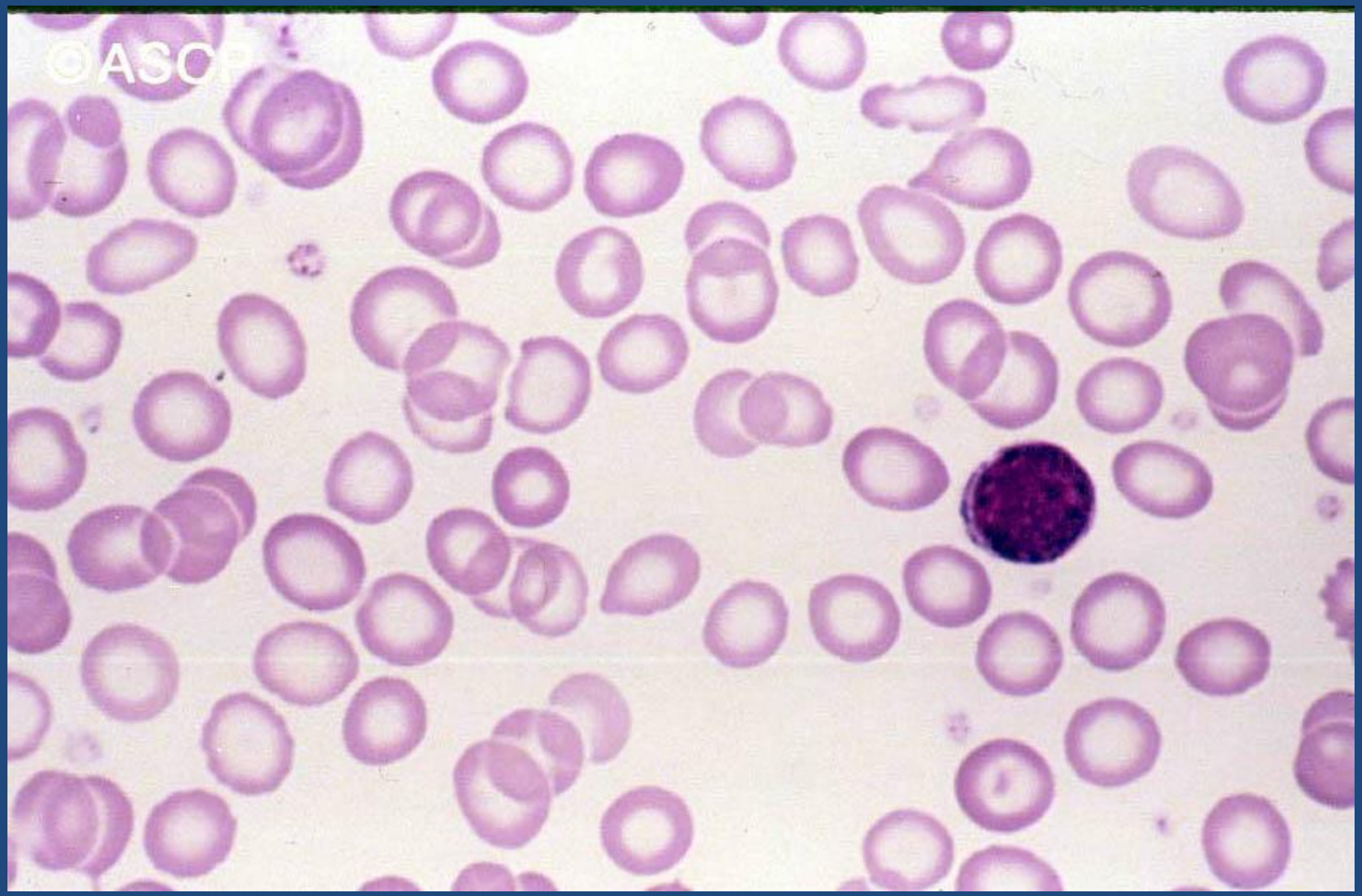
Blood smear of iron deficiency

microcytic, hypochromic, tears, elliptos



A tired 80 year old man

Military Unit: UNKNOWN

Dec 11 @ 1059 (Coll) BLOO

WBC	4.2		(3.4-9.8)	X(10)3
RBC CNT	6.17	H	(4.5-5.9)	X(10)6
HGB	12.5	L	(14.0-18.0)	g/dL
HCT	39.5	L	(41-52)	%
MCV	64.0	L	(83-98)	fL
MCH	20.3	L	(28-33)	pg
MCHC	31.6		(31-36)	g/dL
RDW	16.7	H	(10.0-14.0)	%
NRBC	0.0		(0.0-0.0)	/100 WBC
PLATELETS	126	L	(142-362)	X(10)3
MPV	8.9		(6.7-11.1)	fL
NEUT%	66.4		(41-73)	%
LYMPH%	20.4		(18-46)	%
MONO%	10.2	H	(0-10.0)	%

nquiry Expand pgDn pgUp Print deVice eXit Help
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Again some anemia, low MCV, high RDW, etc. Again iron deficiency? No

Military Unit: UNKNOWN

Dec 11 @ 1059 (Coll)

WBC	4.2		(3.4-9.8)
RBC CNT	6.17	H	(4.5-5.9)
HGB	12.5	L	(14.0-18.0)
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PLATELETS	126	L	(142-362)
MPV	8.9		(6.7-11.1)
NEUT%	66.4		(41-73)
LYMPH%	20.4		(18-46)
MONO%	10.2	H	(0-10.0)

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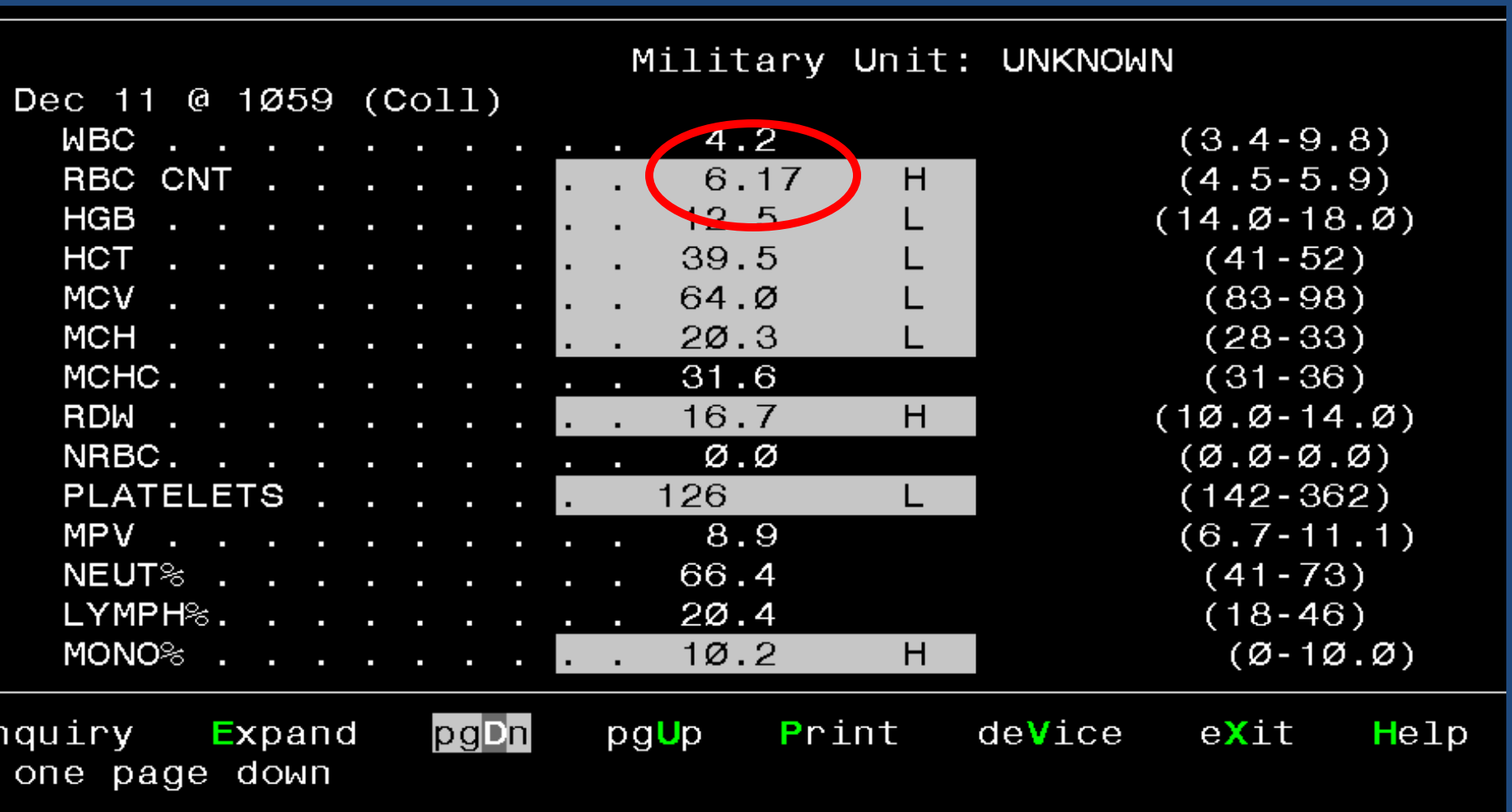
High RBC count with anemia and low MCV → Thalassemia



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PLATELETS	126	L	(142-362)
MPV	8.9		(6.7-11.1)
NEUT%	66.4		(41-73)
LYMPH%	20.4		(18-46)
MONO%	10.2	H	(0-10.0)

nquiry Expand pgDn pgUp Print deVice eXit Help
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Classic finding in Thalassemia are Target cells

A tired 45 year old woman

Military Unit: UNKNOWN

Nov Ø9 @ 1442 (Coll)

WBC	10.ØØ		(4.3-10.Ø)
RBC CNT	6.Ø9	H	(4.Ø-5.2)
HGB	15.9		(12.Ø-16.Ø)
HCT	48.4	H	(36-46)
MCV	79.5	L	(8Ø-1ØØ)
MCH	26.1		(26-34)
MCHC	32.9		(31-36)
RDW	16.3	H	(11.5-14.5)
NRBC	Ø.Ø		(Ø.Ø-Ø.Ø)
PLATELETS	325		(15Ø-4ØØ)
MPV	11.2	H	(7.4-1Ø.4)
NEUT%	64.6		(36-66)
LYMPH%	22.5	L	(24-44)
MONO%	9.2	H	(Ø-7.1)

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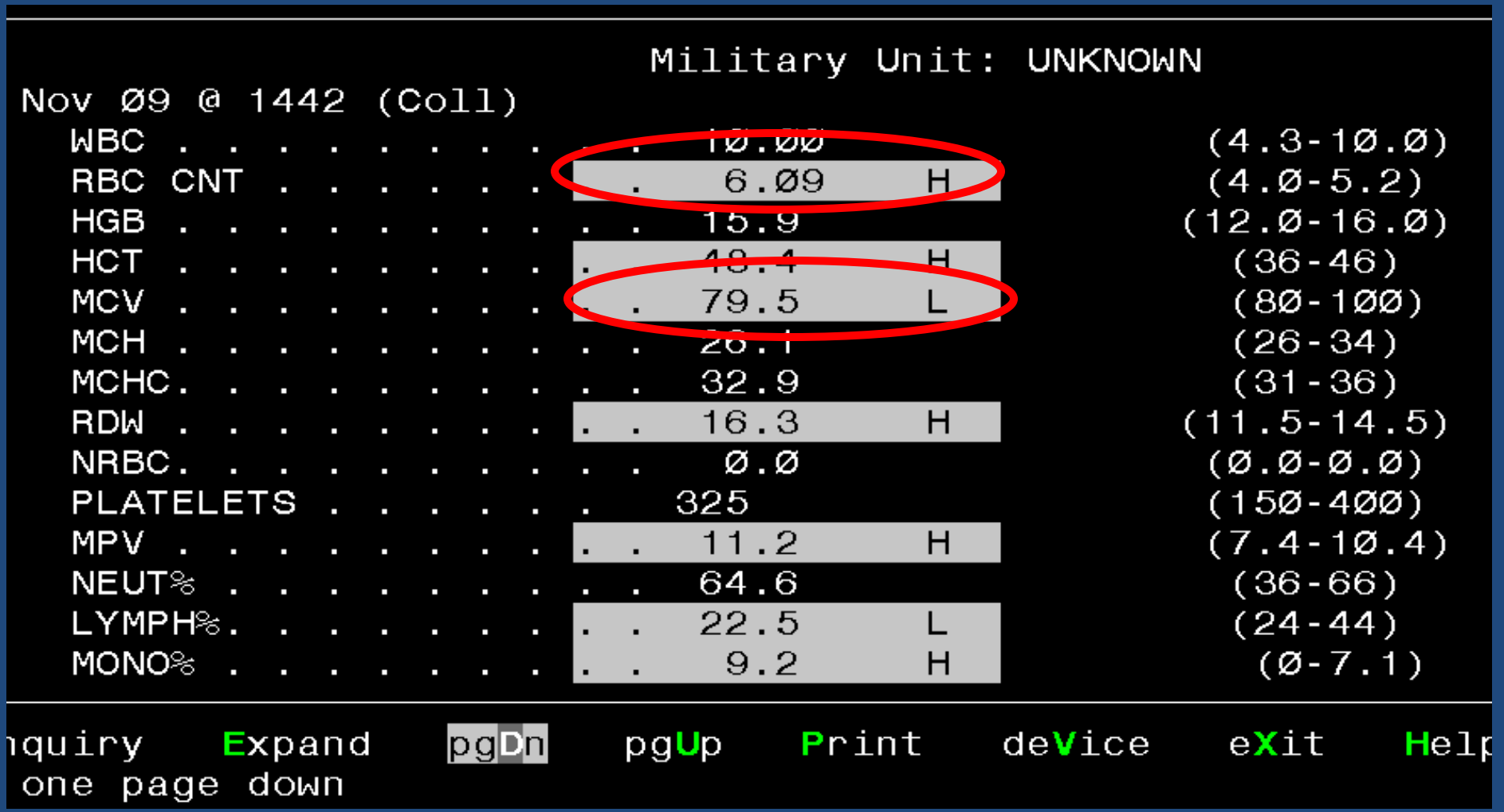
Again High RBC with low MCV
Not thalassemia this time



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MONO%	9.2	H	(Ø-7.1)

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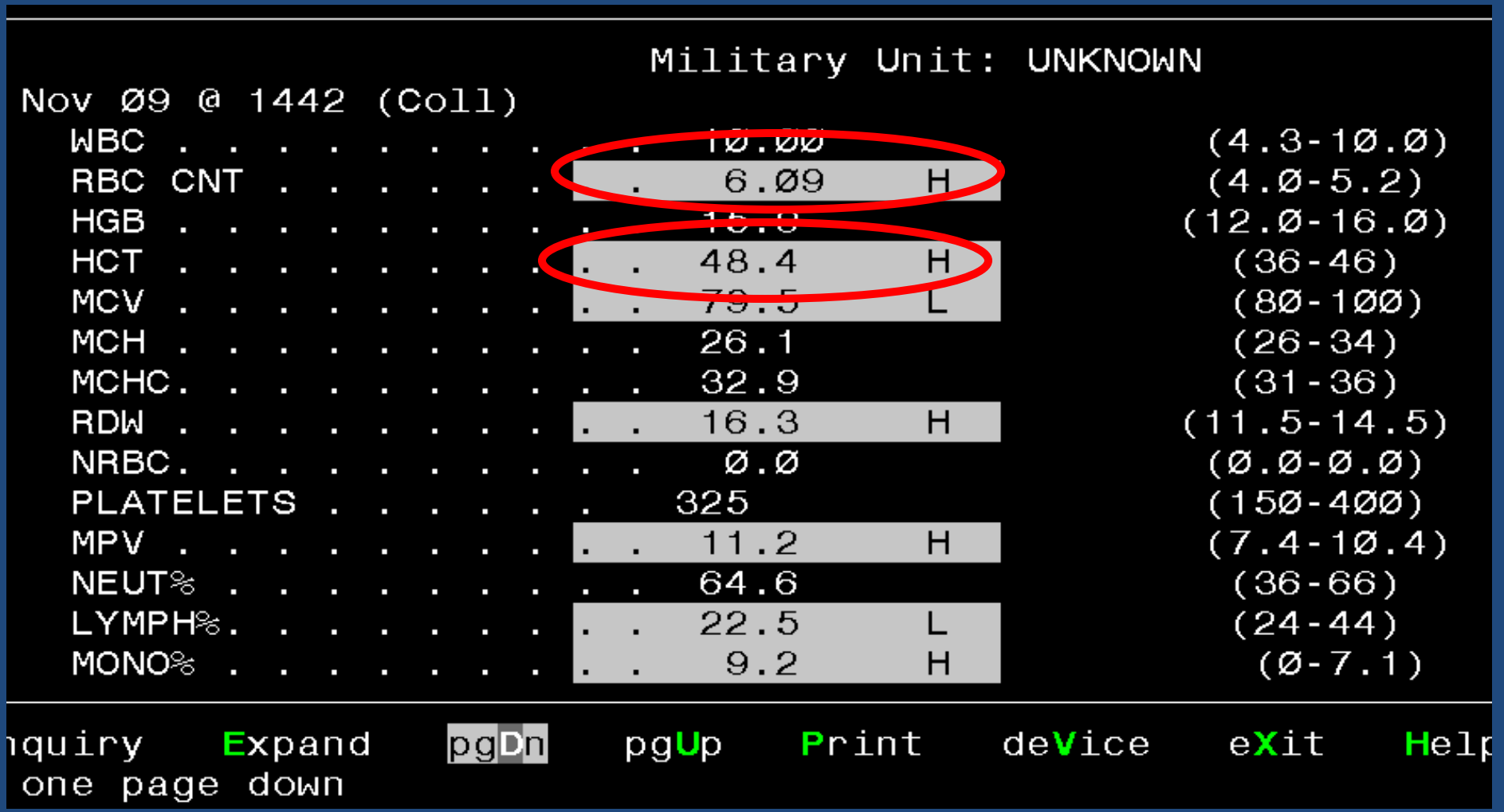
Again High RBC with low MCV
Her HCT is too high → Polycythemia

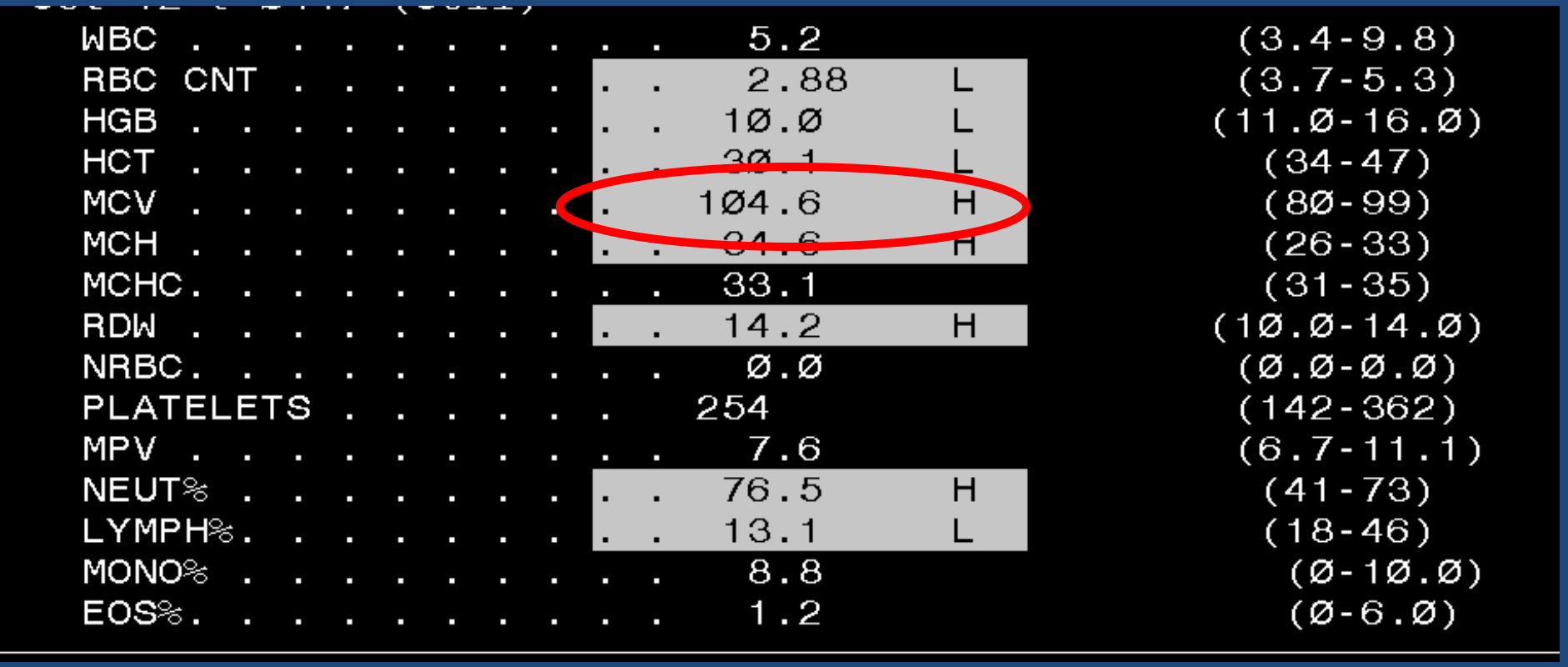


A tired middle aged man

WBC	5.2		(3.4-9.8)
RBC CNT	2.88	L	(3.7-5.3)
HGB	10.0	L	(11.0-16.0)
HCT	30.1	L	(34-47)
MCV	104.6	H	(80-99)
MCH	34.6	H	(26-33)
MCHC	33.1		(31-35)
RDW	14.2	H	(10.0-14.0)
NRBC	0.0		(0.0-0.0)
PLATELETS	254		(142-362)
MPV	7.6		(6.7-11.1)
NEUT%	76.5	H	(41-73)
LYMPH%	13.1	L	(18-46)
MONO%	8.8		(0-10.0)
EOS%	1.2		(0-6.0)

Elevated MCV with anemia

Think?_____



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HGB	10.0	L	(11.0-16.0)
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MCV	104.6	H	(80-99)
MCH	34.6	H	(26-33)
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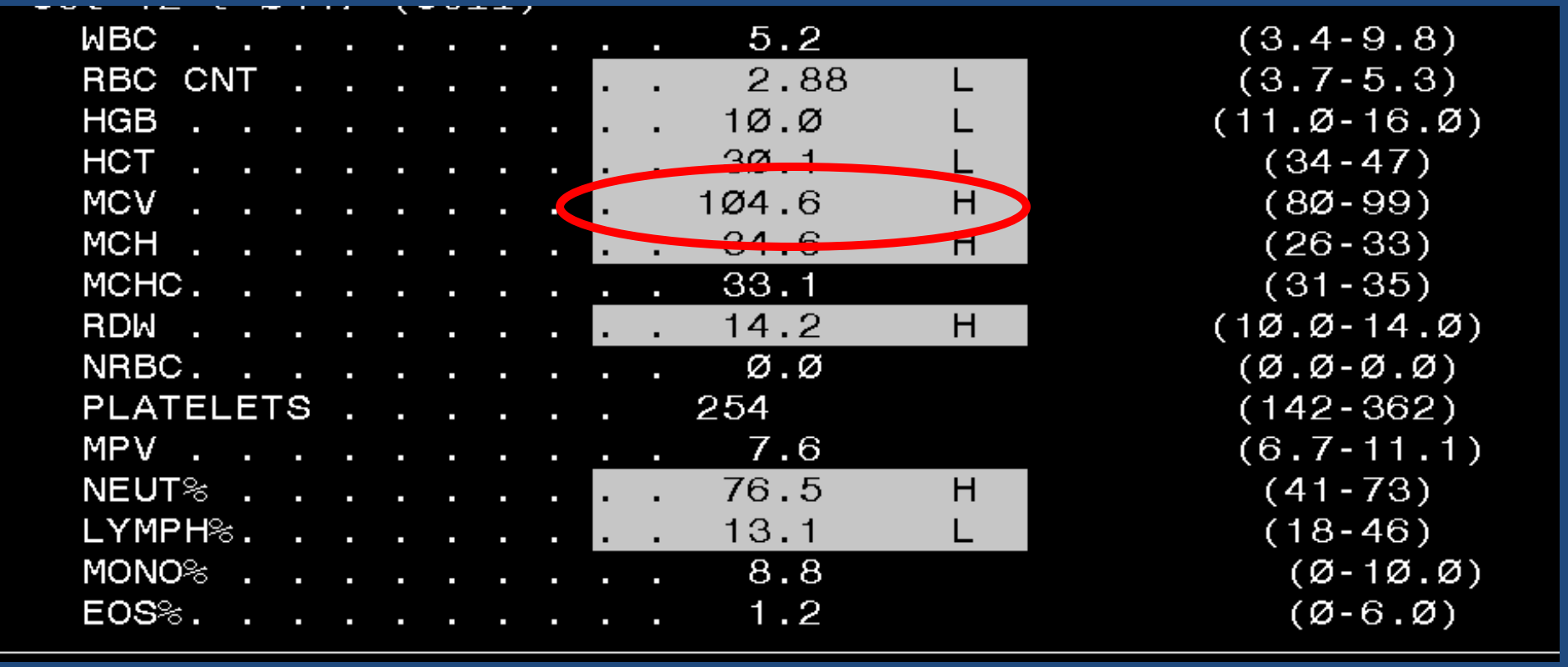
Elevated MCV with anemia

B12 or Folate deficiency

Myelodysplasia

Liver disease, alcohol



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LYMPH%	13.1	L	(18-46)
MONO%	8.8		(0-10.0)
EOS%	1.2		(0-6.0)

Replace B12 or folate if low

If not → bone marrow

WBC	5.2		(3.4-9.8)
RBC CNT	2.88	L	(3.7-5.3)
HGB	10.0	L	(11.0-16.0)
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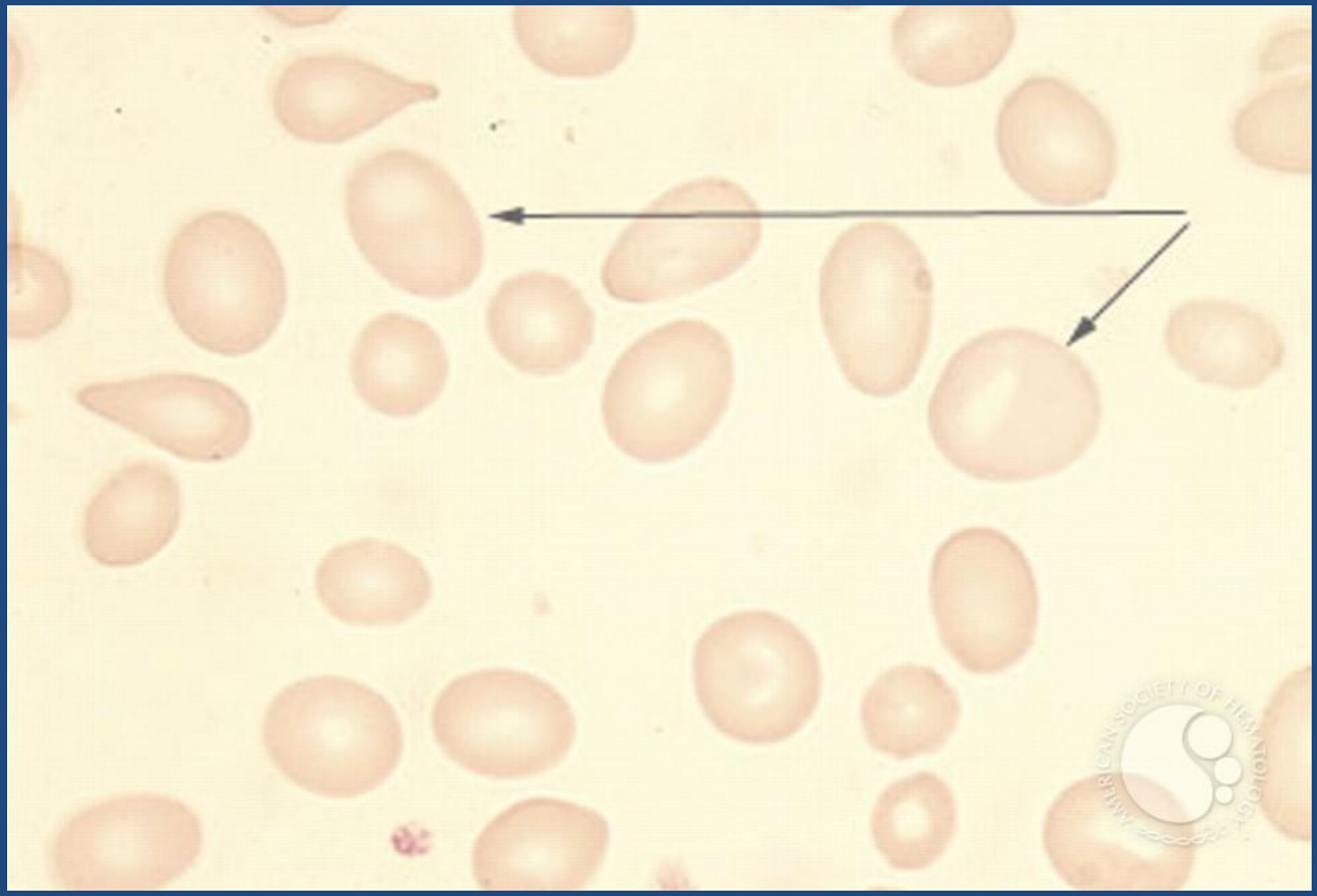
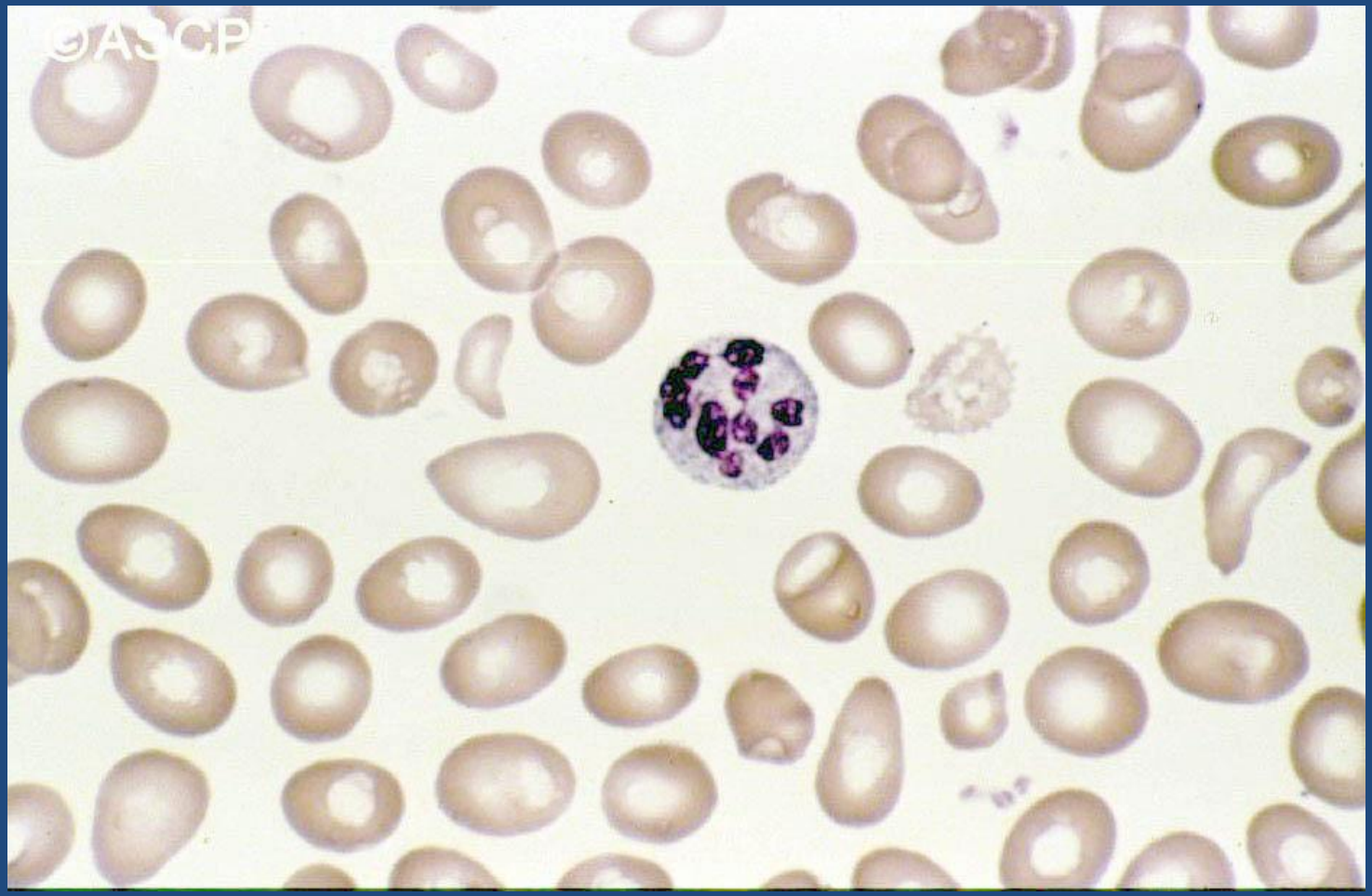
Typical megaloblastic changes

Ovalocytes, tears, and



Hypersegmented neutrophils
B12 deficiency



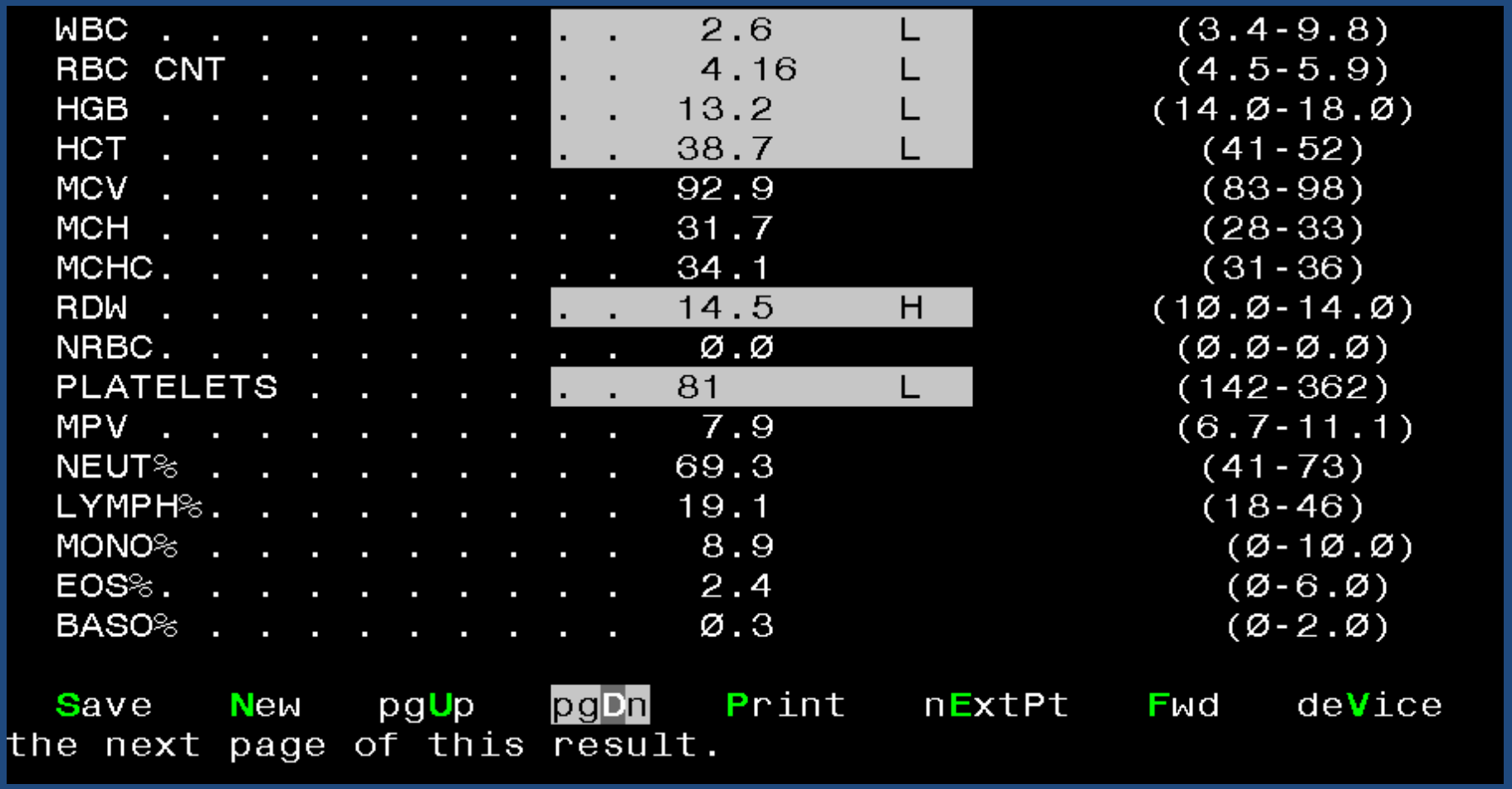
Most rapidly increasing source of B12 and iron deficiency referrals in our clinic?

Bariatric Surgery

- Post gastric bypass, most patients lose ability to absorb sufficient iron or B12 from diet or pills.

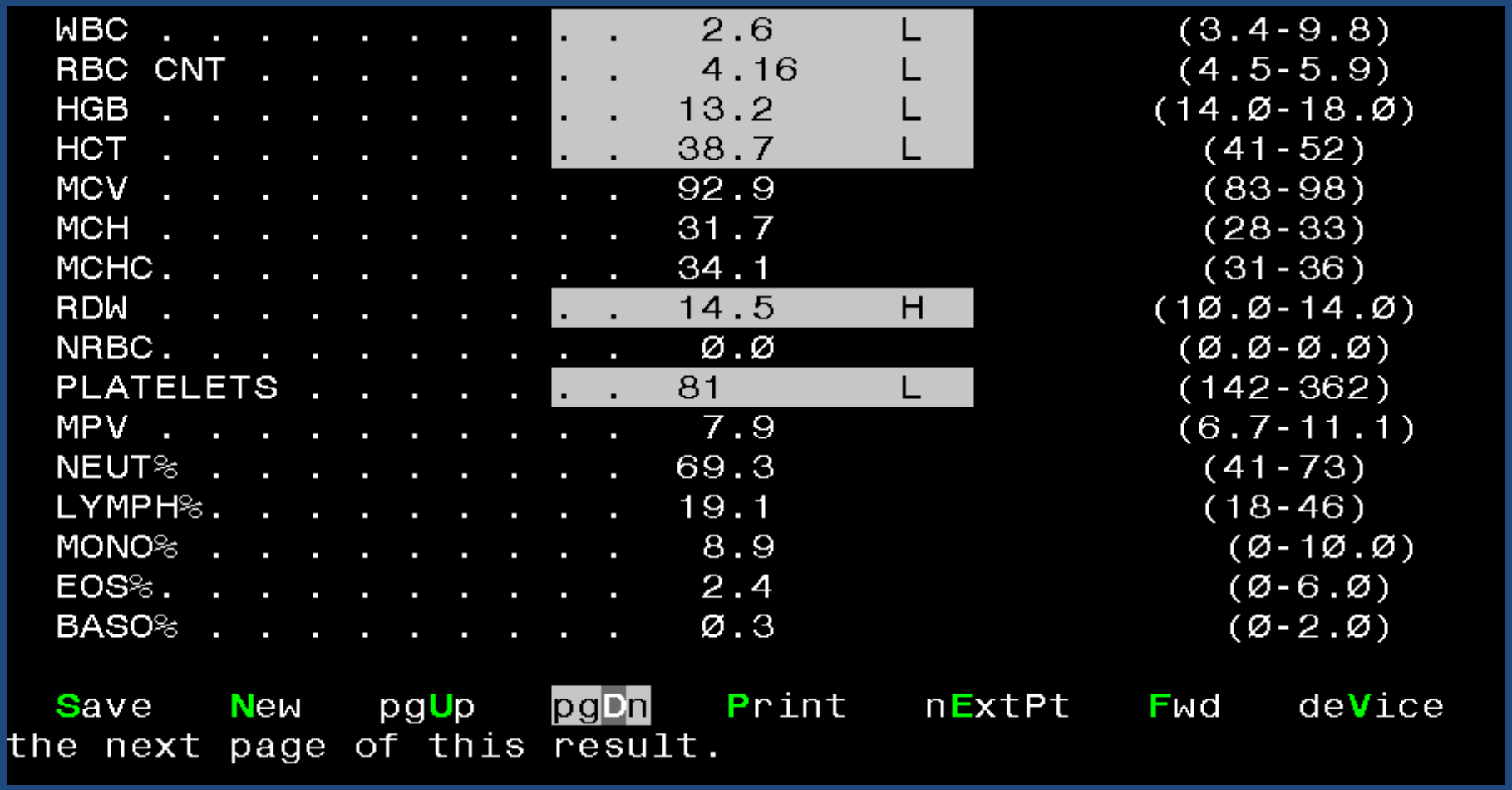
- We supplement iv (iron) or im/sq (B12)

Another common referral
Another tired man



Mild pancytopenia

WBC, Plts and Hct all mildly down

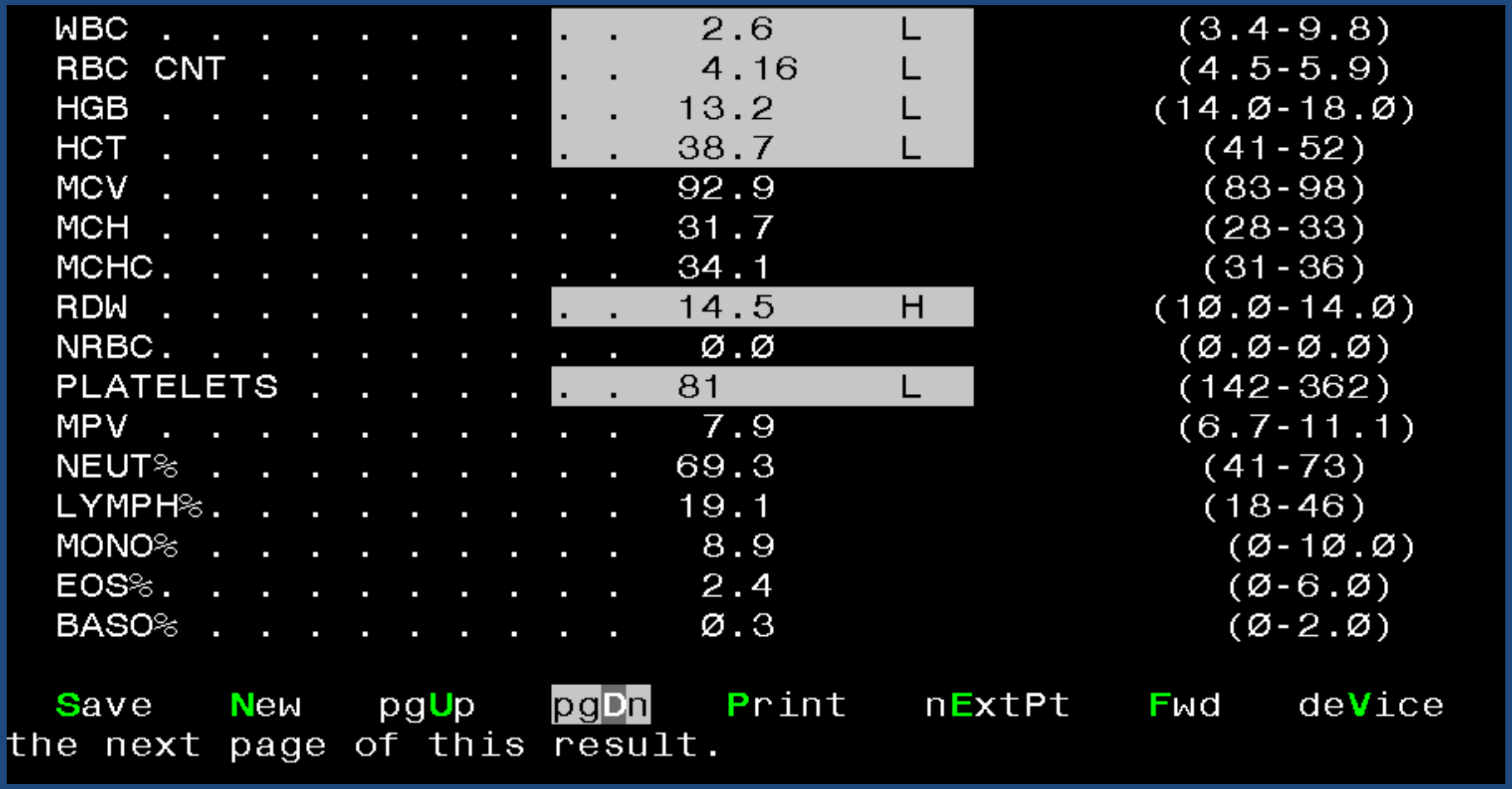


WBC	2.6	L	(3.4-9.8)
RBC CNT	4.16	L	(4.5-5.9)
HGB	13.2	L	(14.0-18.0)
HCT	38.7	L	(41-52)
MCV	92.9		(83-98)
MCH	31.7		(28-33)
MCHC	34.1		(31-36)
RDW	14.5	H	(10.0-14.0)
NRBC	0.0		(0.0-0.0)
PLATELETS	81	L	(142-362)
MPV	7.9		(6.7-11.1)
NEUT%	69.3		(41-73)
LYMPH%	19.1		(18-46)
MONO%	8.9		(0-10.0)
EOS%	2.4		(0-6.0)
BASO%	0.3		(0-2.0)

Save New pgUp pgDn Print nExtPt Fwd deVice

the next page of this result.

Think about Liver disease with sequestration, alcohol, MDS, B12

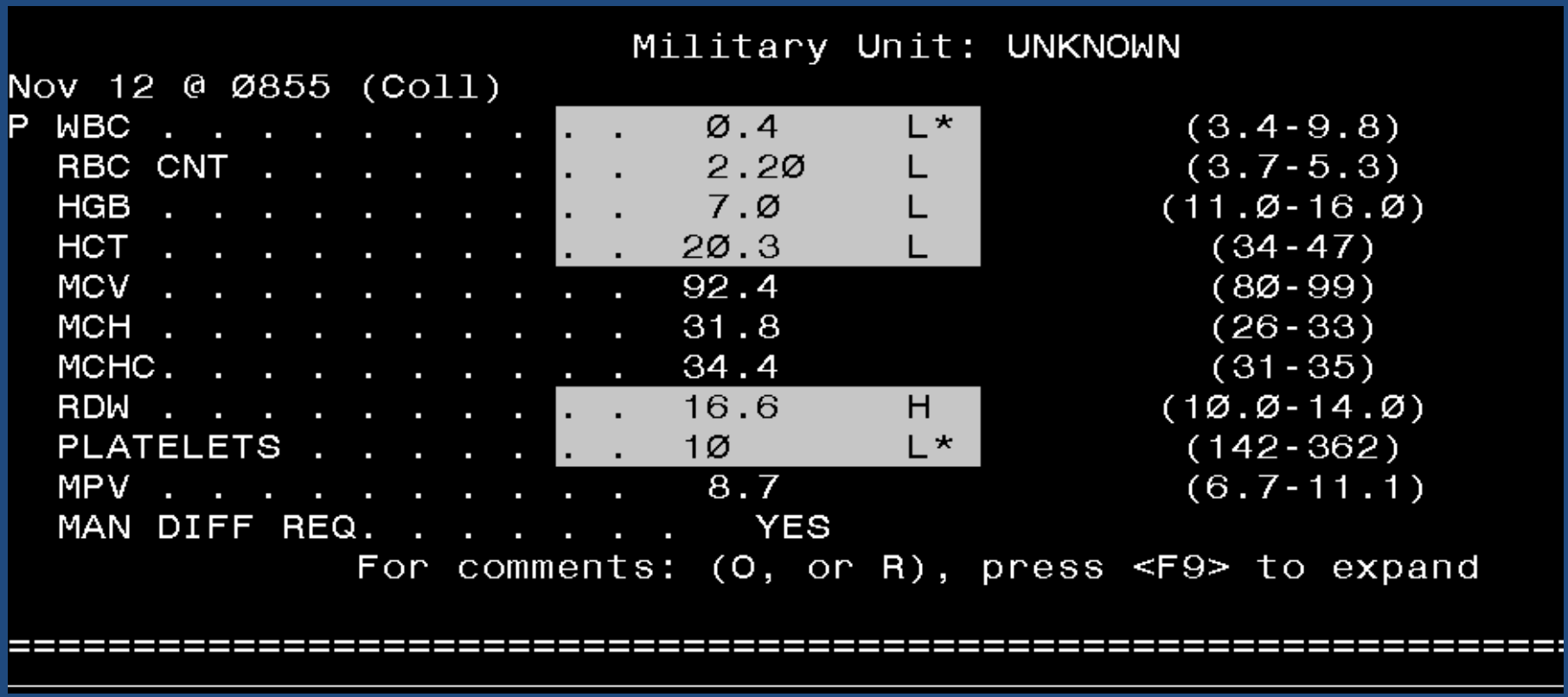


WBC	2.6	L	(3.4-9.8)
RBC CNT	4.16	L	(4.5-5.9)
HGB	13.2	L	(14.0-18.0)
HCT	38.7	L	(41-52)
MCV	92.9		(83-98)
MCH	31.7		(28-33)
MCHC	34.1		(31-36)
RDW	14.5	H	(10.0-14.0)
NRBC	0.0		(0.0-0.0)
PLATELETS	81	L	(142-362)
MPV	7.9		(6.7-11.1)
NEUT%	69.3		(41-73)
LYMPH%	19.1		(18-46)
MONO%	8.9		(0-10.0)
EOS%	2.4		(0-6.0)
BASO%	0.3		(0-2.0)

Save New pgUp pgDn Print nExtPt Fwd deVice

the next page of this result.

A tired young man



Military Unit: UNKNOWN

Nov 12 @ 0855 (Coll)

P WBC	0.4	L*	(3.4-9.8)
RBC CNT	2.20	L	(3.7-5.3)
HGB	7.0	L	(11.0-16.0)
HCT	20.3	L	(34-47)
MCV	92.4		(80-99)
MCH	31.8		(26-33)
MCHC	34.4		(31-35)
RDW	16.6	H	(10.0-14.0)
PLATELETS	10	L*	(142-362)
MPV	8.7		(6.7-11.1)
MAN DIFF REQ	YES		

For comments: (O, or R), press <F9> to expand

Severe pancytopenia

Everything down

This is an emergency

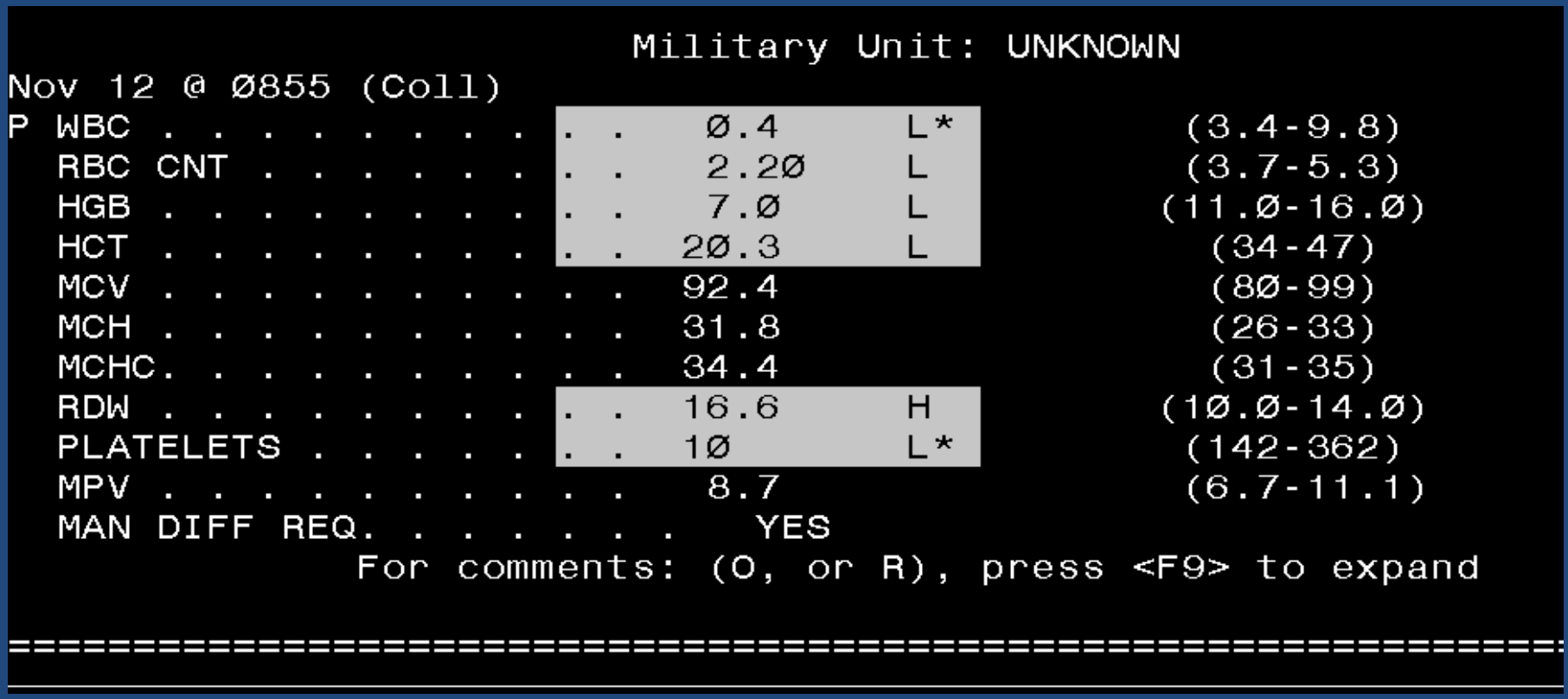
Military Unit: UNKNOWN

Nov 12 @ 0855 (Coll)

P WBC	0.4	L*	(3.4-9.8)
RBC CNT	2.20	L	(3.7-5.3)
HGB	7.0	L	(11.0-16.0)
HCT	20.3	L	(34-47)
MCV	92.4		(80-99)
MCH	31.8		(26-33)
MCHC	34.4		(31-35)
RDW	16.6	H	(10.0-14.0)
PLATELETS	10	L*	(142-362)
MPV	8.7		(6.7-11.1)
MAN DIFF REQ.	YES		

For comments: (O, or R), press <F9> to expand

Severe pancytopenia
Typically admit and bone marrow for probable leukemia or aplastic anemia or myelodysplasia

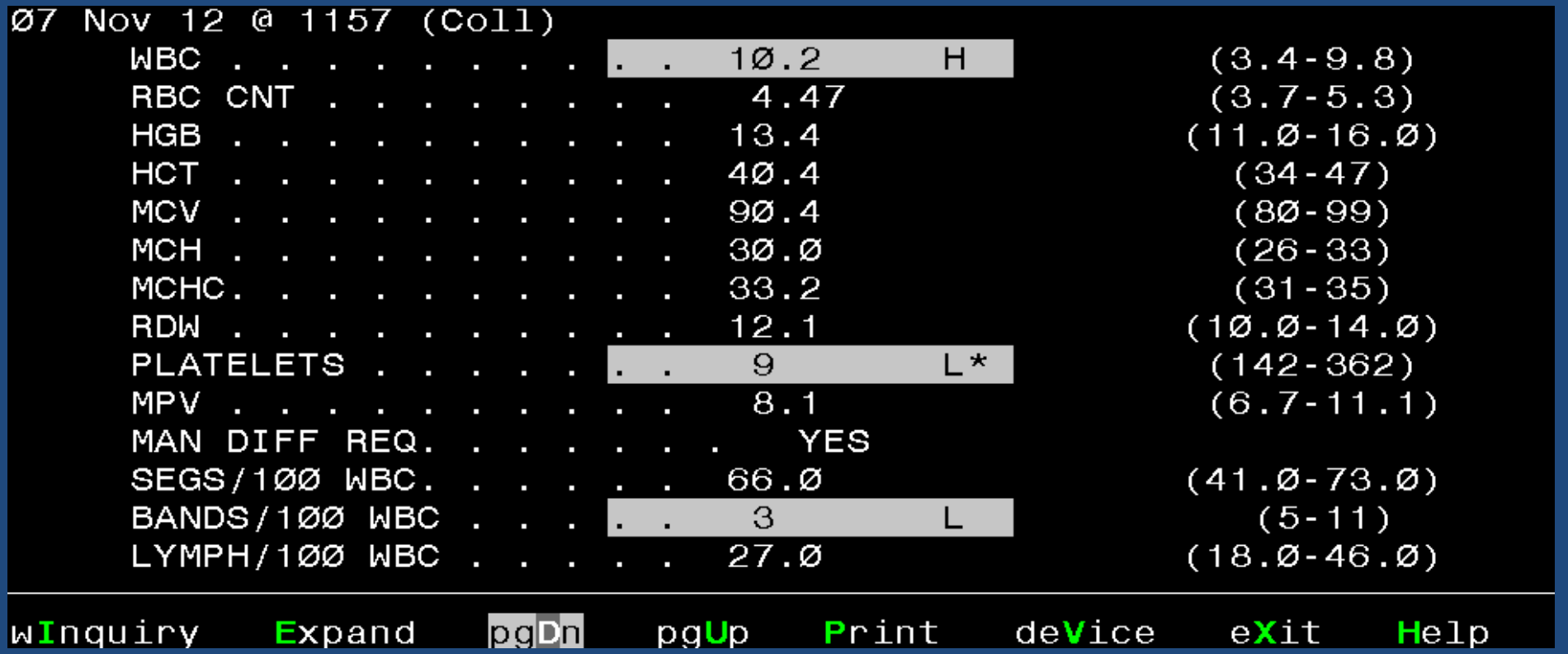


Military Unit: UNKNOWN

Nov 12 @ 0855 (Coll)			
P WBC	0.4	L*	(3.4-9.8)
RBC CNT	2.20	L	(3.7-5.3)
HGB	7.0	L	(11.0-16.0)
HCT	20.3	L	(34-47)
MCV	92.4		(80-99)
MCH	31.8		(26-33)
MCHC	34.4		(31-35)
RDW	16.6	H	(10.0-14.0)
PLATELETS	10	L*	(142-362)
MPV	8.7		(6.7-11.1)
MAN DIFF REQ.	YES		

For comments: (O, or R), press <F9> to expand

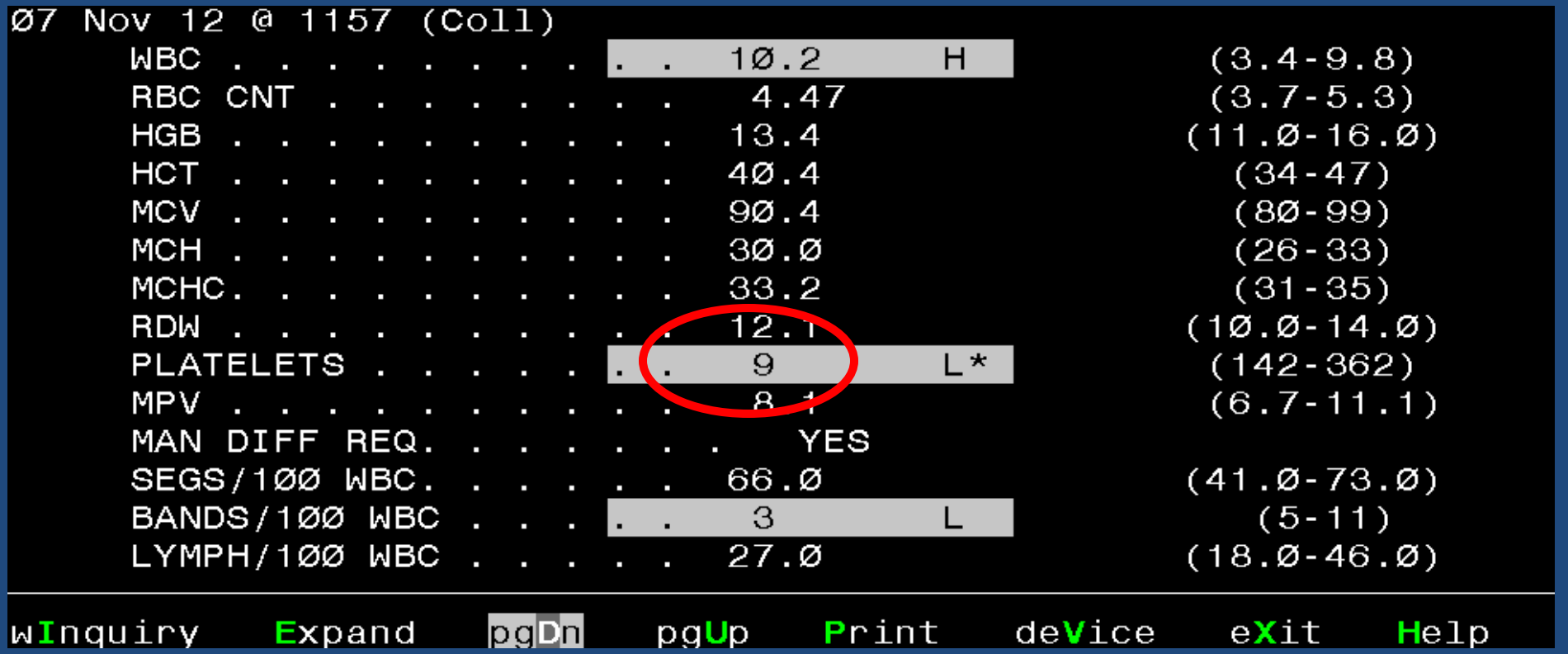
In clinic just yesterday a young lady with red spots…



```
Ø7 Nov 12 @ 1157 (Coll)
     WBC . . . . . .  10.2      H      (3.4-9.8)
     RBC CNT . . . . .  4.47           (3.7-5.3)
     HGB . . . . . .  13.4             (11.Ø-16.Ø)
     HCT . . . . . .  4Ø.4             (34-47)
     MCV . . . . . .  9Ø.4             (8Ø-99)
     MCH . . . . . .  3Ø.Ø             (26-33)
     MCHC. . . . . .  33.2             (31-35)
     RDW . . . . . .  12.1             (1Ø.Ø-14.Ø)
     PLATELETS . . . .  9       L*     (142-362)
     MPV . . . . . .  8.1              (6.7-11.1)
     MAN DIFF REQ. . . .  YES
     SEGS/1ØØ WBC. . . .  66.Ø         (41.Ø-73.Ø)
     BANDS/1ØØ WBC . . .  3     L        (5-11)
     LYMPH/1ØØ WBC . . .  27.Ø         (18.Ø-46.Ø)

wInquiry  Expand  pgDn  pgUp  Print  deVice  eXit  Help
```

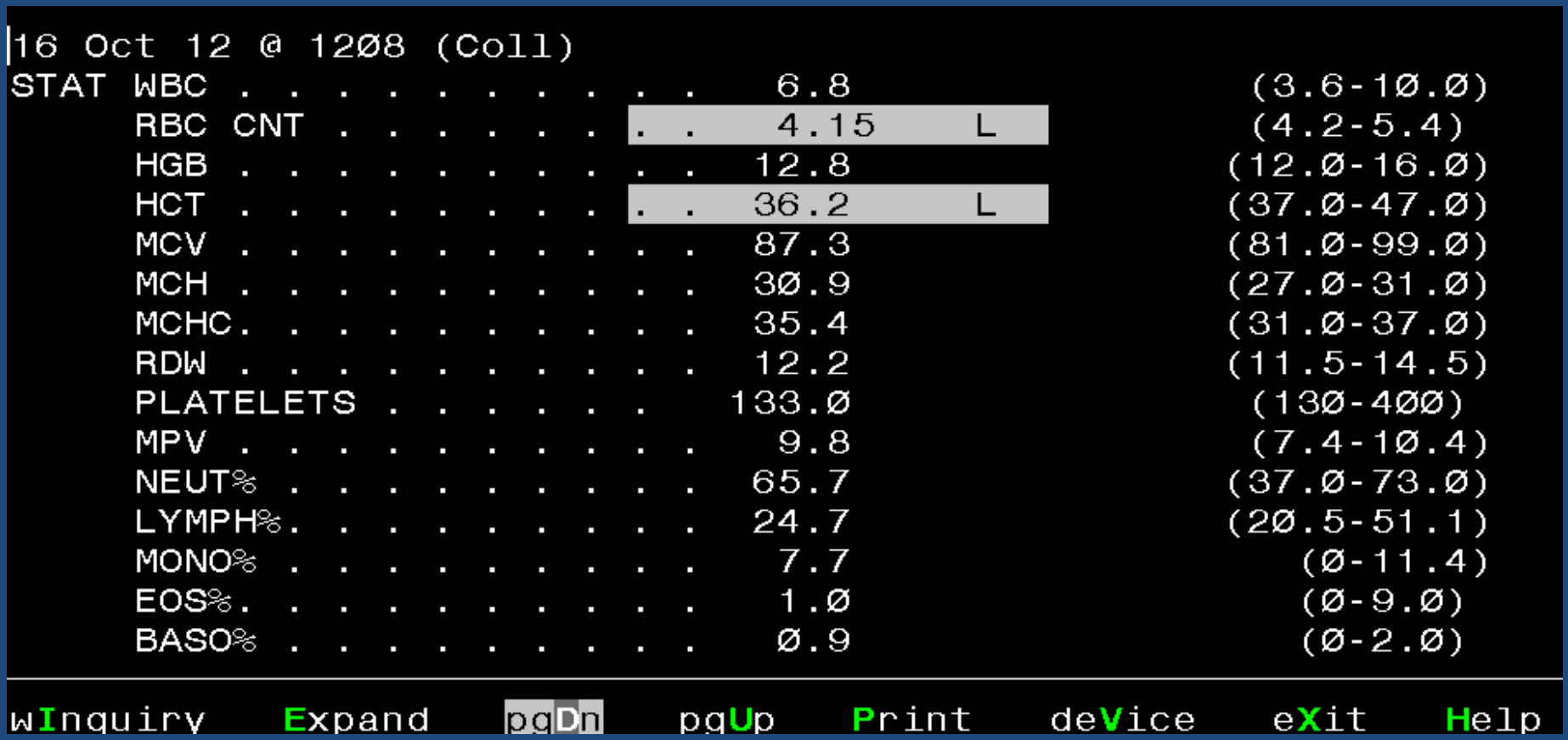
Very low platelets!
In clinic yesterday



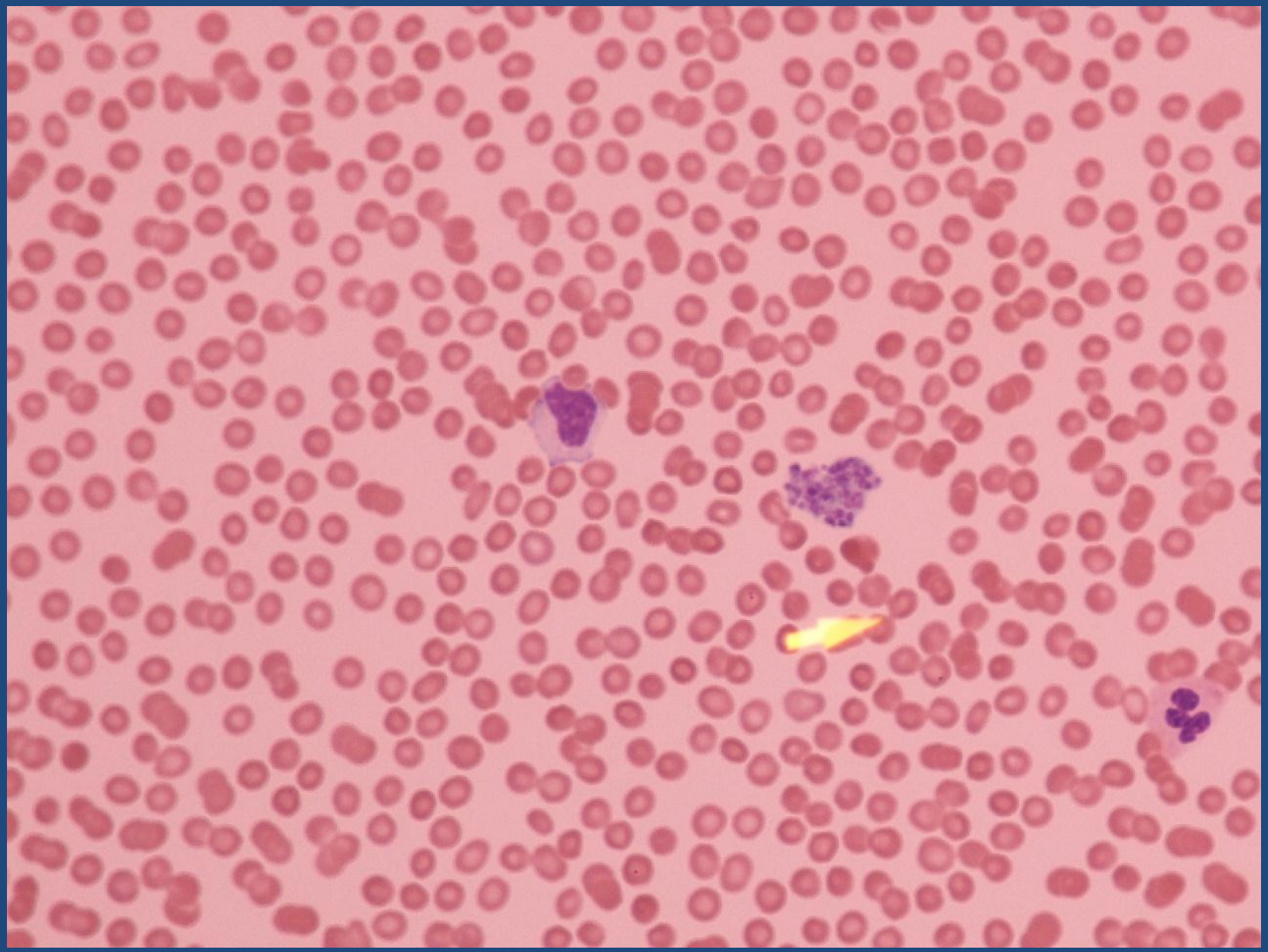
07 Nov 12 @ 1157 (Coll)			
WBC	10.2	H	(3.4-9.8)
RBC CNT	4.47		(3.7-5.3)
HGB	13.4		(11.0-16.0)
HCT	40.4		(34-47)
MCV	90.4		(80-99)
MCH	30.0		(26-33)
MCHC	33.2		(31-35)
RDW	12.1		(10.0-14.0)
PLATELETS	9	L*	(142-362)
MPV	8.1		(6.7-11.1)
MAN DIFF REQ	YES		
SEGS/100 WBC	66.0		(41.0-73.0)
BANDS/100 WBC	3	L	(5-11)
LYMPH/100 WBC	27.0		(18.0-46.0)

wInquiry Expand pgDn pgUp Print deVice eXit Help

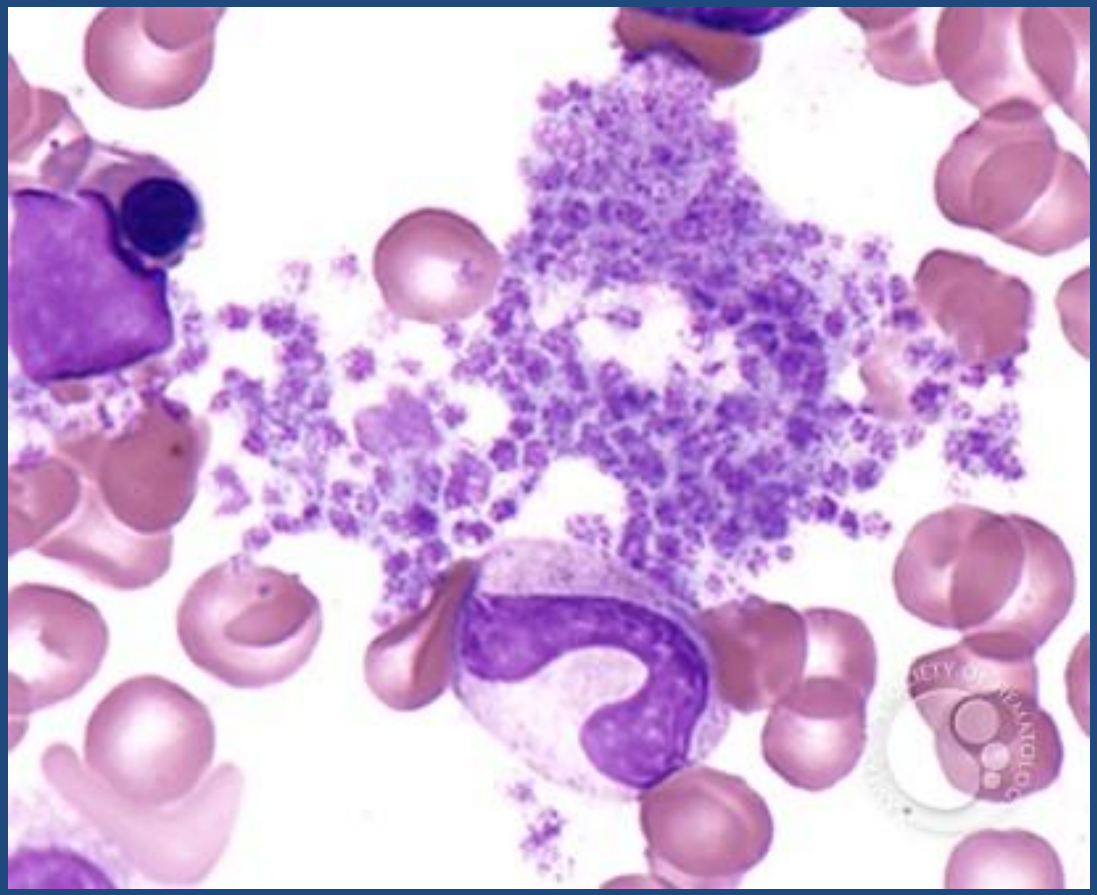
Same Patient a month earlier



Her Blood Smear

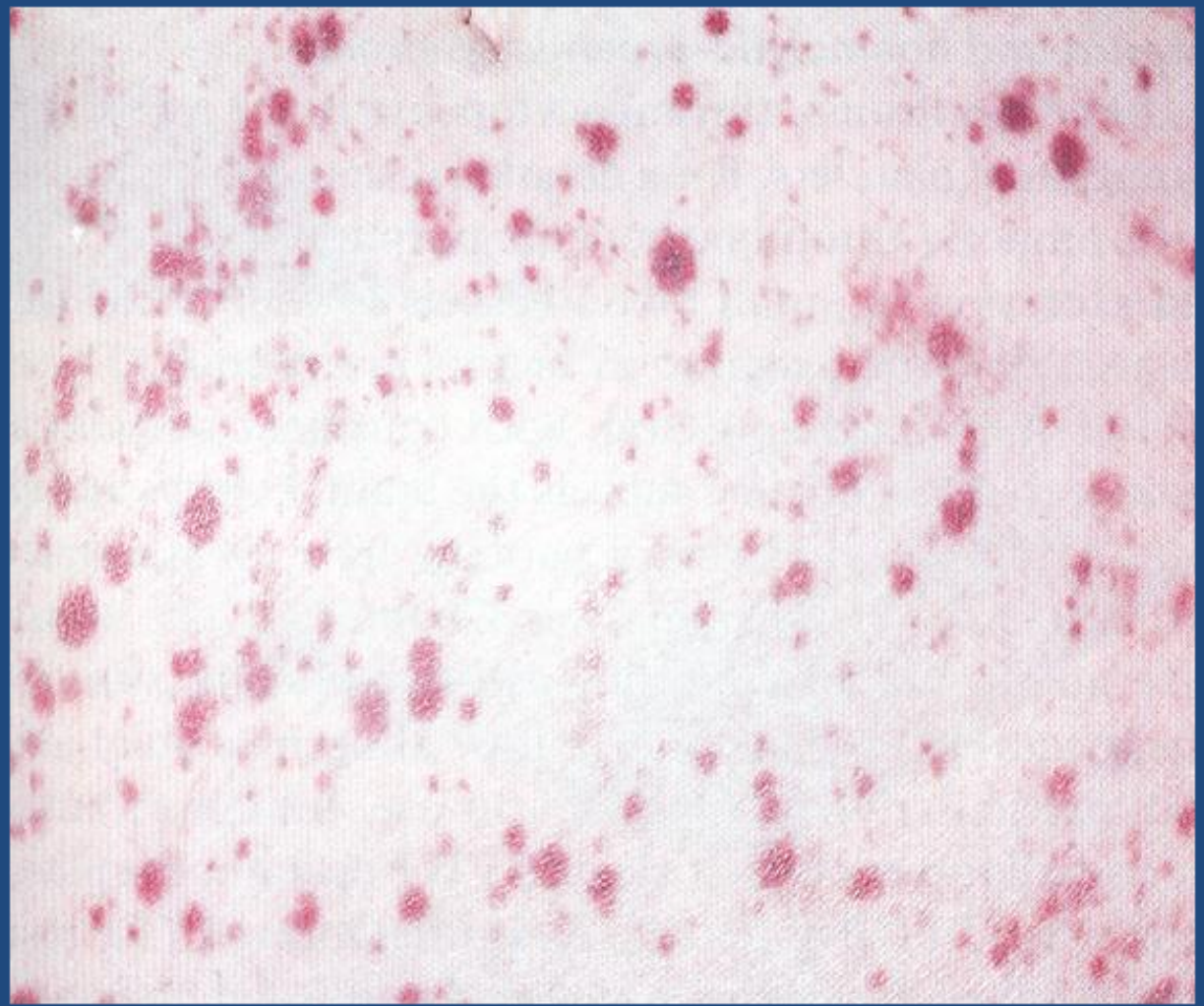


Platelet clumping

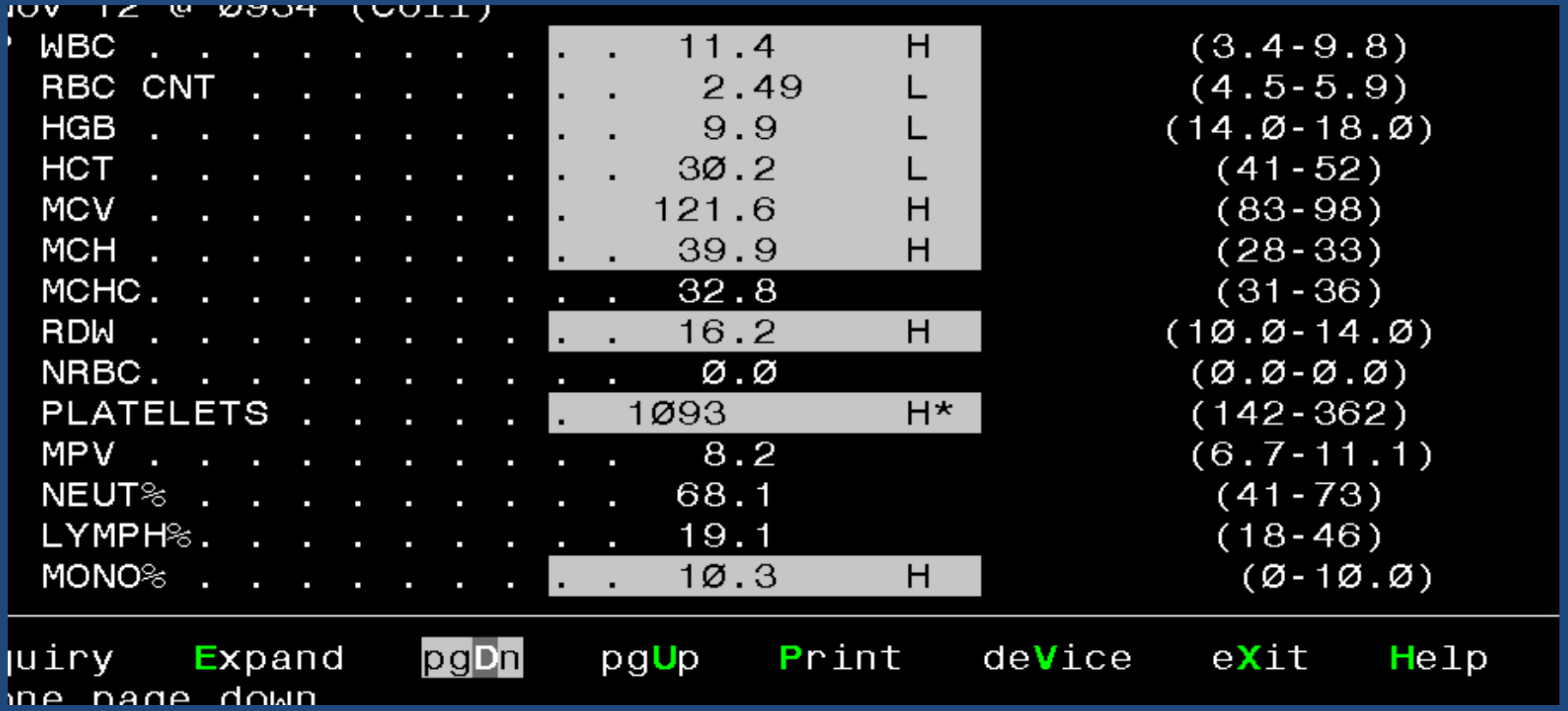


These are Petechiae

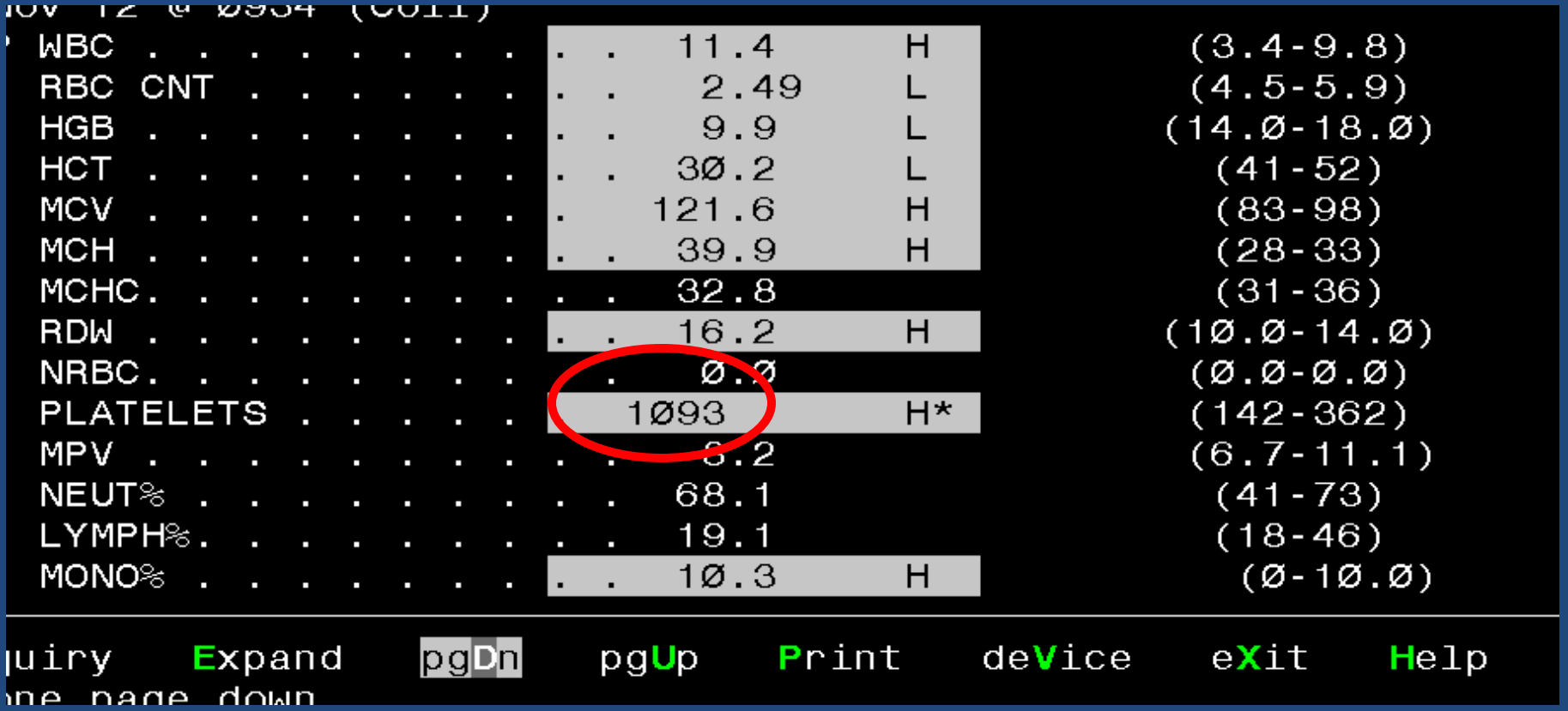
Small intradermal bleeds from low platelets. They don't blanch with pressure



Another patient in clinic yesterday



High Platelets

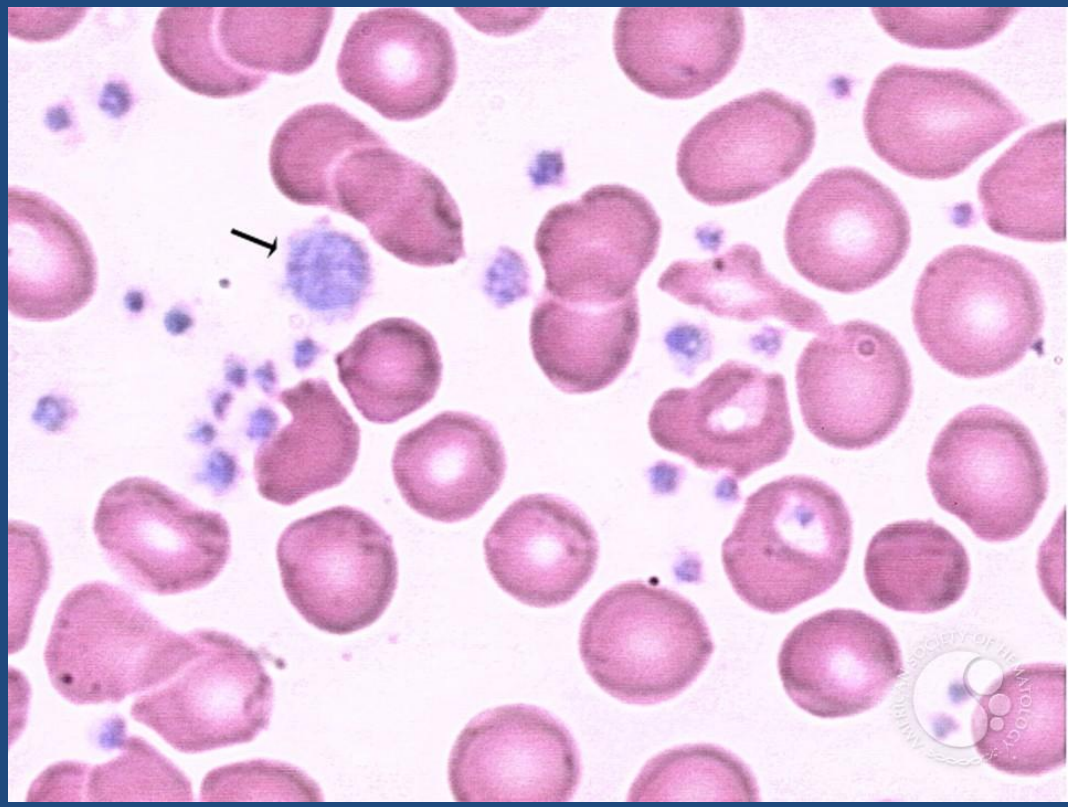


Thrombocytosis

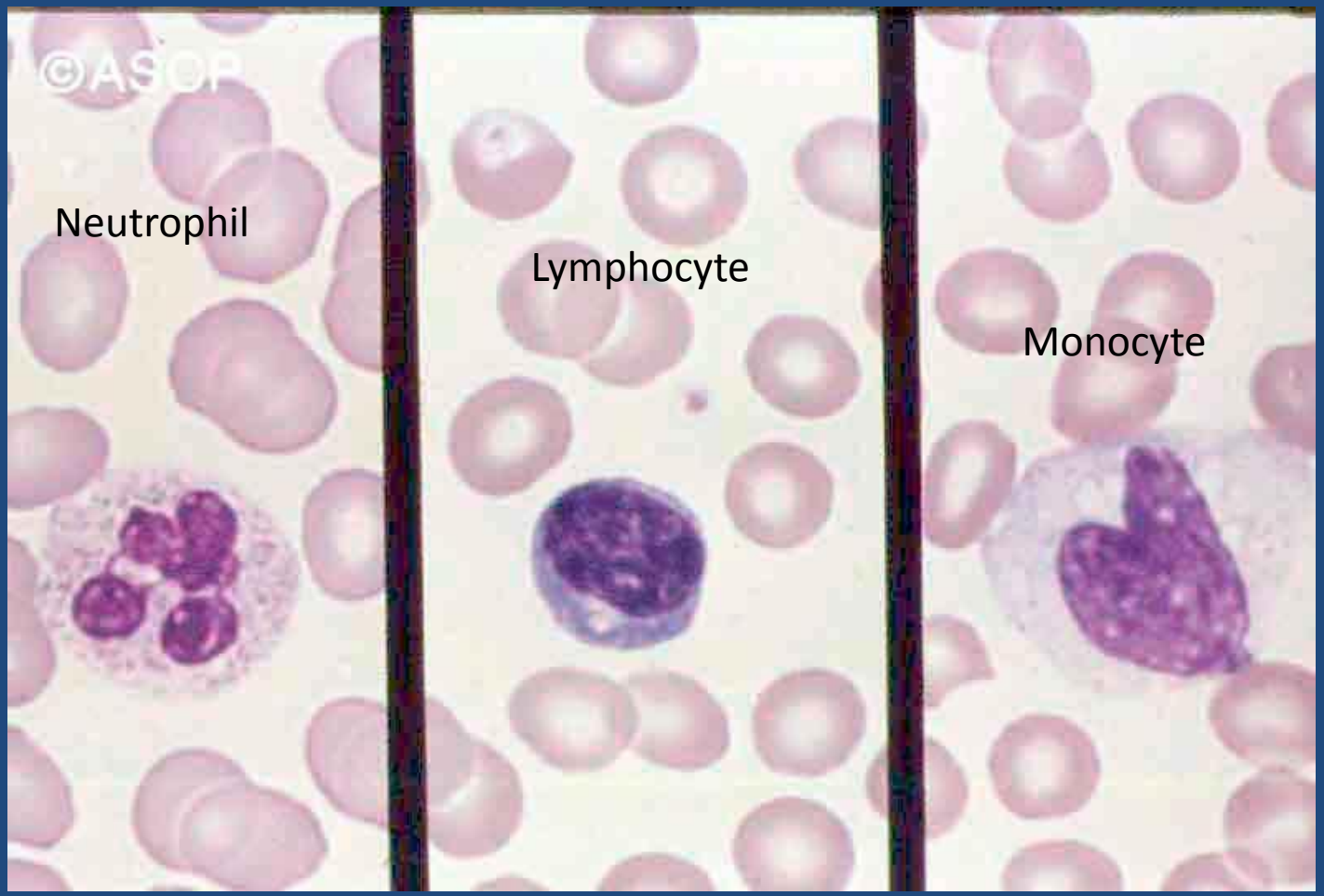
- Too high?
- Limited differential
- Essential thrombocytosis (or other MPD)

- Post Splenectomy

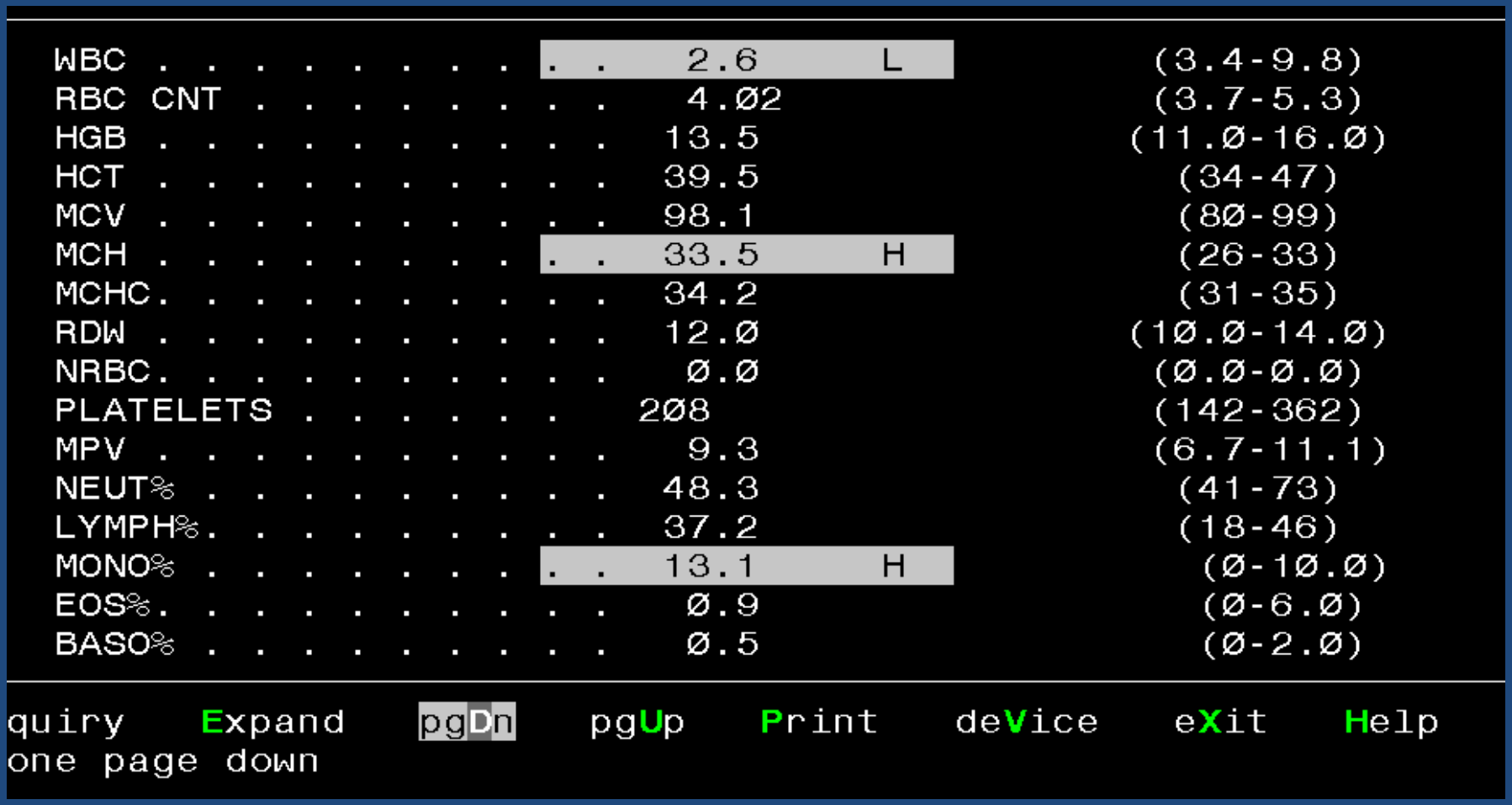
- Reactive
  - iron deficiency



White blood cells



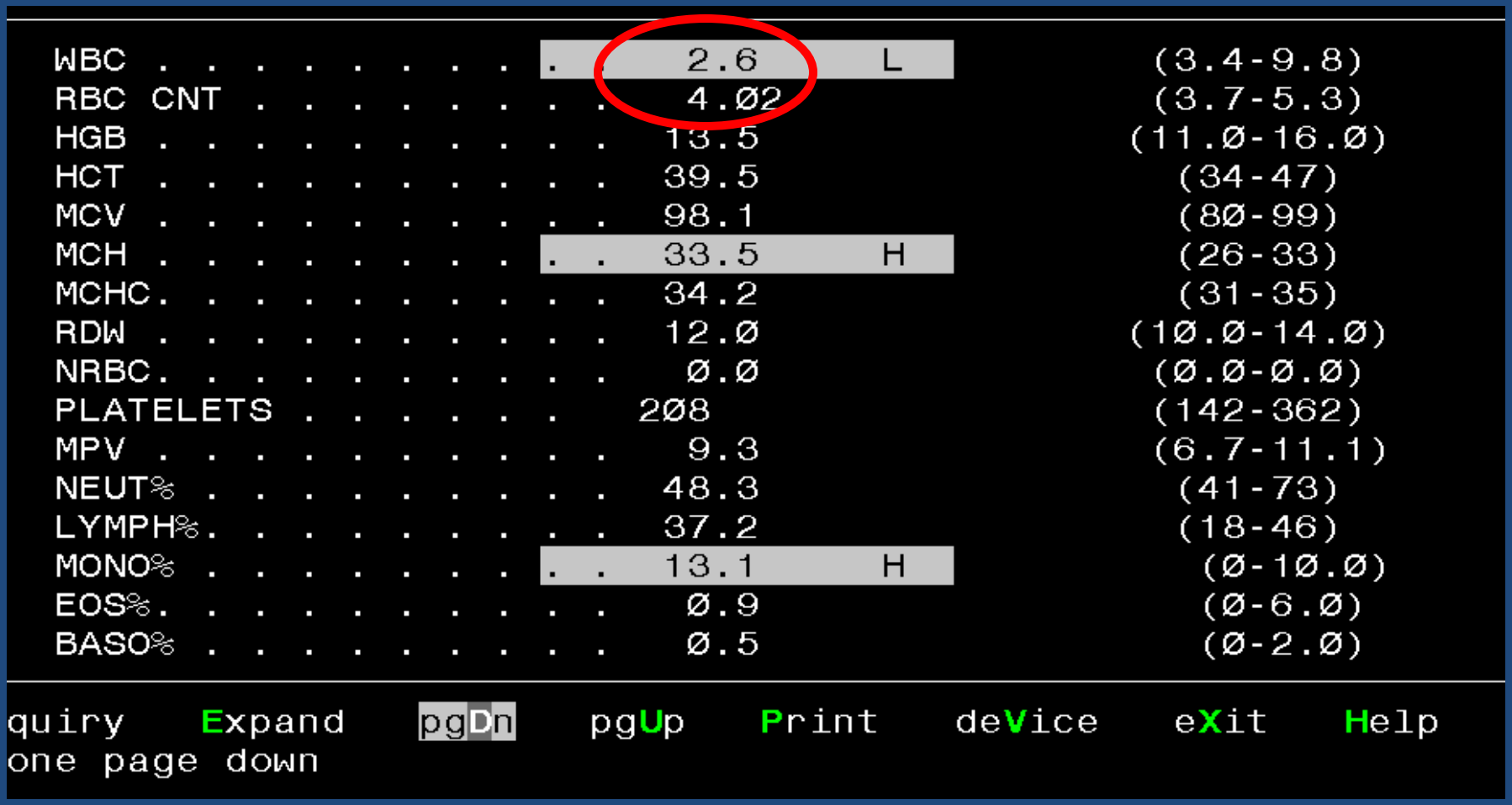
Our 2nd most common referral



WBC	2.6	L	(3.4-9.8)
RBC CNT	4.Ø2		(3.7-5.3)
HGB	13.5		(11.Ø-16.Ø)
HCT	39.5		(34-47)
MCV	98.1		(8Ø-99)
MCH	33.5	H	(26-33)
MCHC	34.2		(31-35)
RDW	12.Ø		(1Ø.Ø-14.Ø)
NRBC	Ø.Ø		(Ø.Ø-Ø.Ø)
PLATELETS	2Ø8		(142-362)
MPV	9.3		(6.7-11.1)
NEUT%	48.3		(41-73)
LYMPH%	37.2		(18-46)
MONO%	13.1	H	(Ø-1Ø.Ø)
EOS%	Ø.9		(Ø-6.Ø)
BASO%	Ø.5		(Ø-2.Ø)

quiry Expand pgDn pgUp Print deVice eXit Help
one page down

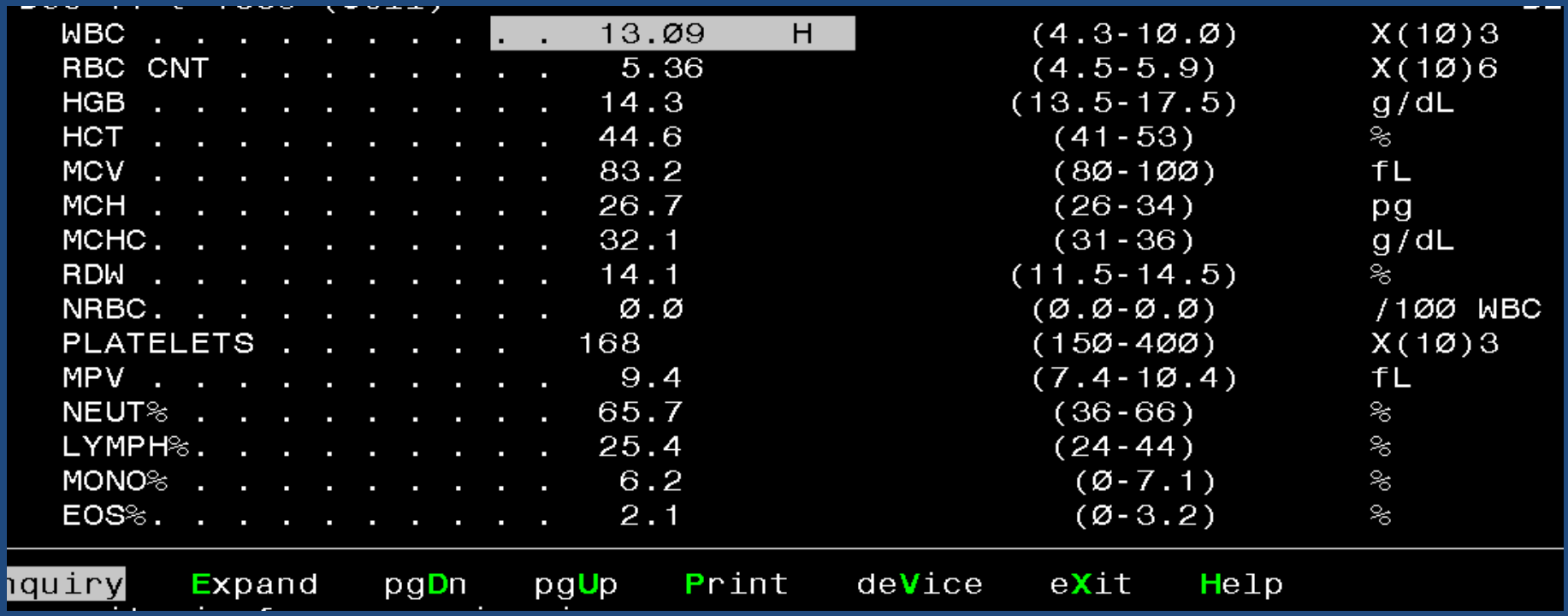
Low WBC


WBC . . . . . 2.6 L (3.4-9.8)
RBC CNT 4.Ø2 (3.7-5.3)
HGB 13.5 (11.Ø-16.Ø)
HCT 39.5 (34-47)
MCV 98.1 (8Ø-99)
MCH . . . . . 33.5 H (26-33)
MCHC. 34.2 (31-35)
RDW 12.Ø (1Ø.Ø-14.Ø)
NRBC. . . . . Ø.Ø (Ø.Ø-Ø.Ø)
PLATELETS 2Ø8 (142-362)
MPV 9.3 (6.7-11.1)
NEUT% 48.3 (41-73)
LYMPH%. 37.2 (18-46)
MONO% . . . . . 13.1 H (Ø-1Ø.Ø)
EOS%. Ø.9 (Ø-6.Ø)
BASO% Ø.5 (Ø-2.Ø)
quiry Expand pgDn pgUp Print deVice eXit Help
one page down

Leukopenia

- 2nd most common hematology consult (after anemia)
- Overwhelming majority are benign
  - Ethnic “Neutropenia”
  - Mild liver disease
  - Over “supplementation” with alcohol

High WBC



WBC	13.Ø9 H	(4.3-1Ø.Ø)	X(1Ø)3
RBC CNT	5.36	(4.5-5.9)	X(1Ø)6
HGB	14.3	(13.5-17.5)	g/dL
HCT	44.6	(41-53)	%
MCV	83.2	(8Ø-1ØØ)	fL
MCH	26.7	(26-34)	pg
MCHC	32.1	(31-36)	g/dL
RDW	14.1	(11.5-14.5)	%
NRBC	Ø.Ø	(Ø.Ø-Ø.Ø)	/1ØØ WBC
PLATELETS	168	(15Ø-4ØØ)	X(1Ø)3
MPV	9.4	(7.4-1Ø.4)	fL
NEUT%	65.7	(36-66)	%
LYMPH%	25.4	(24-44)	%
MONO%	6.2	(Ø-7.1)	%
EOS%	2.1	(Ø-3.2)	%

nquiry Expand pgDn pgUp Print deVice eXit Help

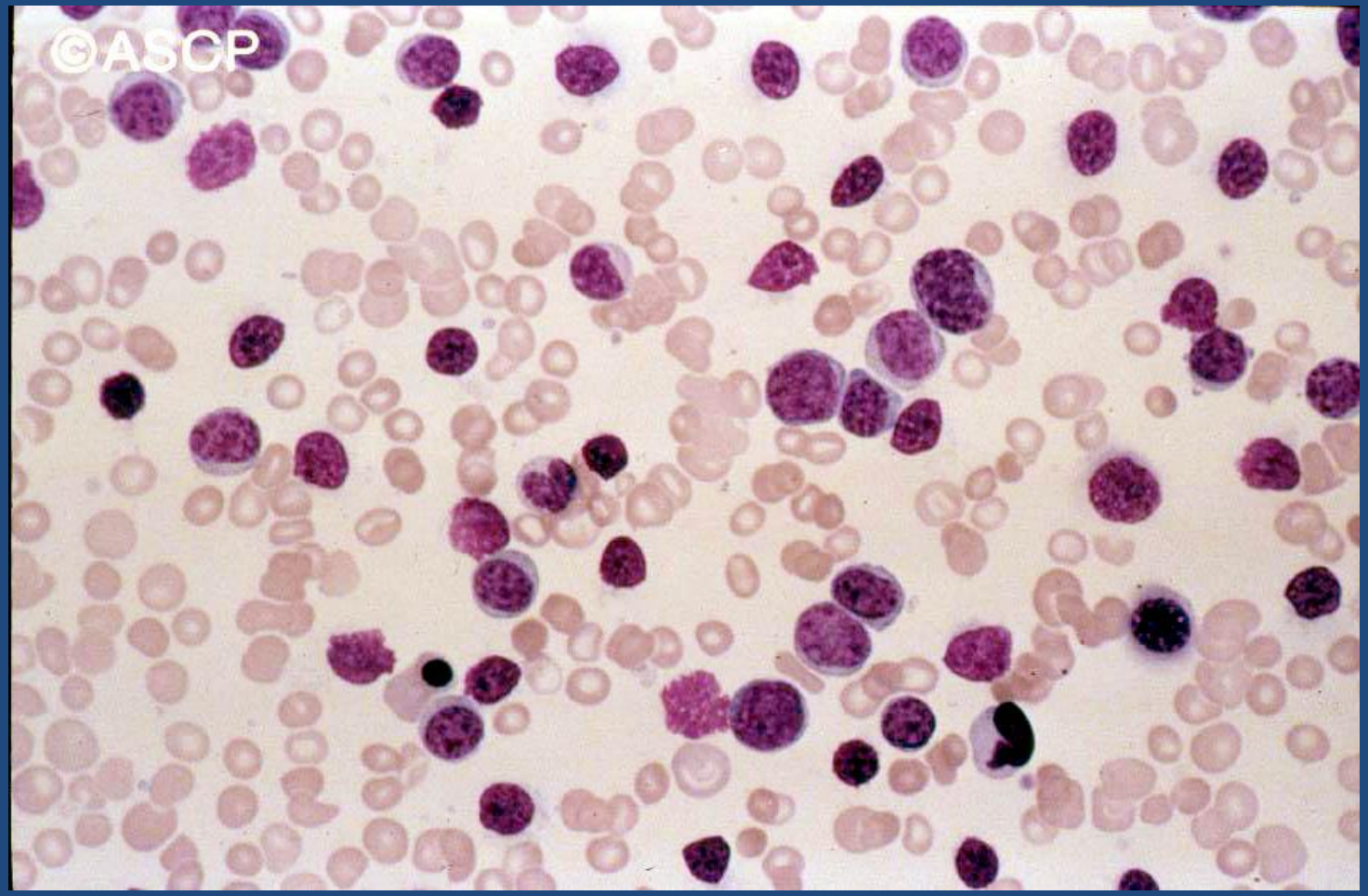
Leukocytosis

- Normal range typically 4 – 11K
- Leukocytosis common in infection
- Commonly see WBCs in 11-19 range without infection from meds, stress, smoking
- Greater than 20 usually infection or primary blood disorder, leukemia
  - Acute or chronic

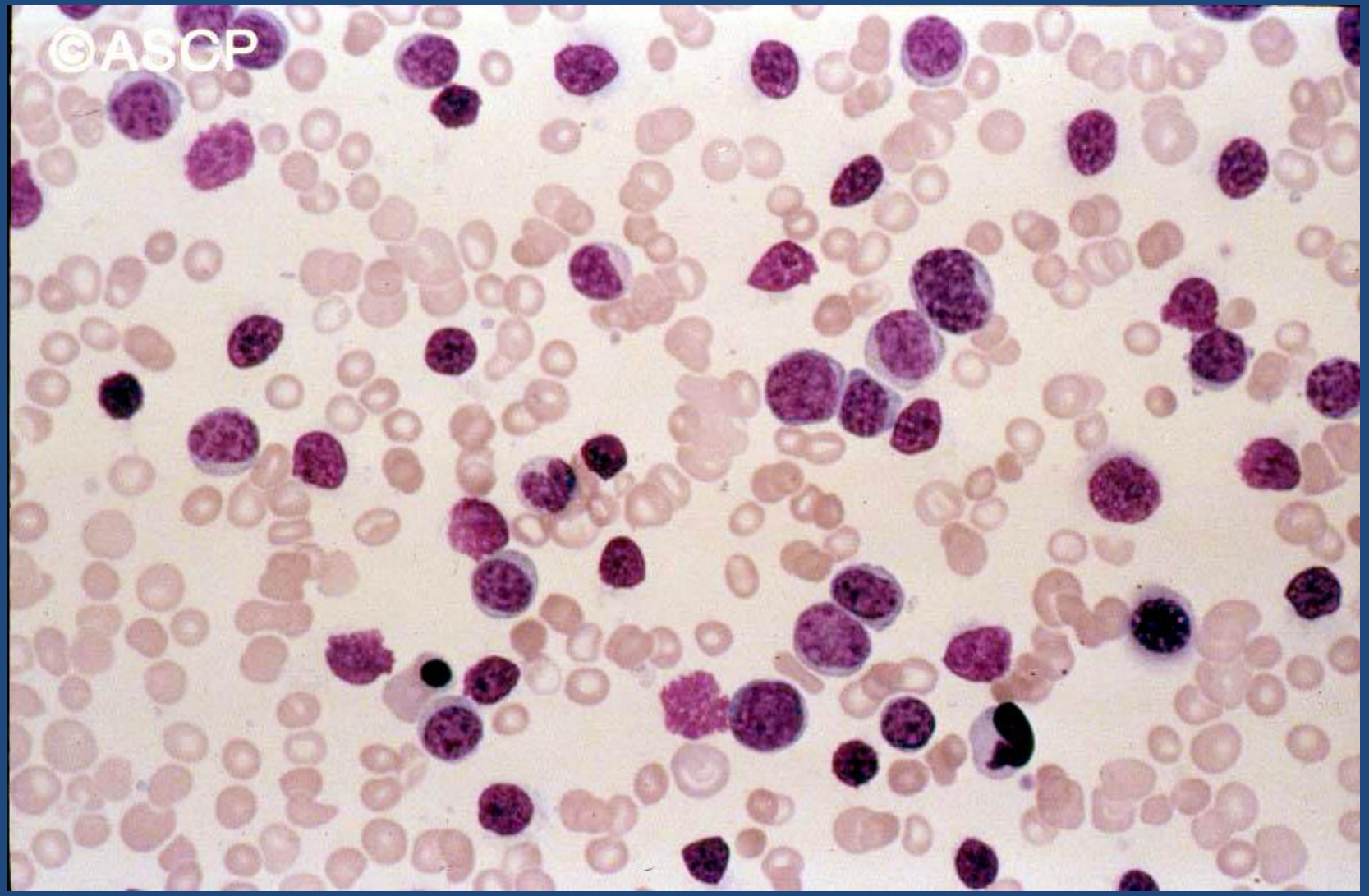
WBC counts >20,000

- All lymphocytes? → CLL
- All Neutrophils? → infection vs CML?
- Immature cells? → usually Leukemia (or sometimes sepsis

Most common leukemia?



CLL – all lymphocytes

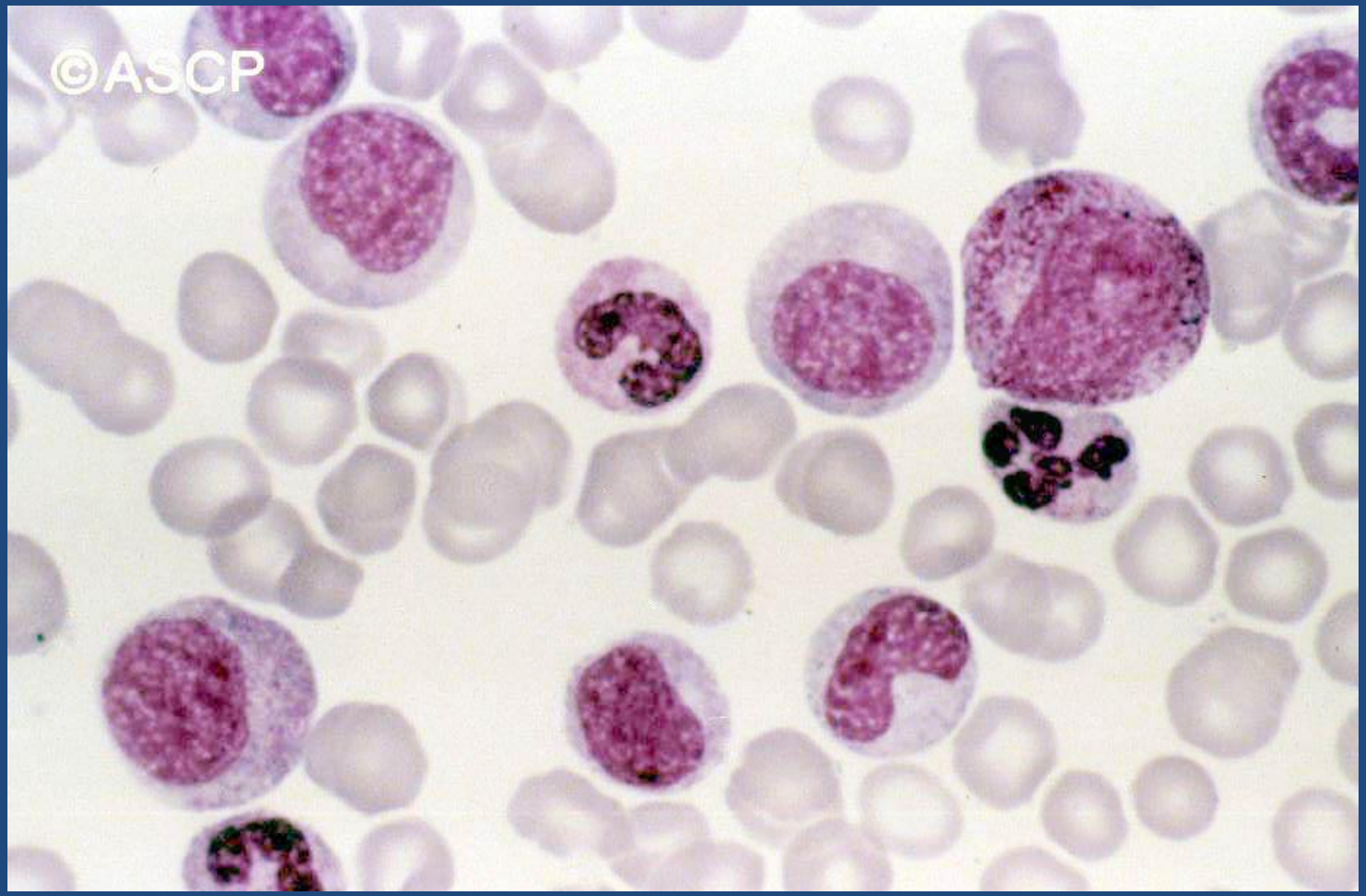


CLL

- Commonly asymptomatic
- Most common presentation is now routine CBC abnormality
- Most require no therapy – even with WBC counts of 100,000 or higher
- Routine referral typically

- Immediate referral → if CLL associated with thrombocytopenia or anemia

CML

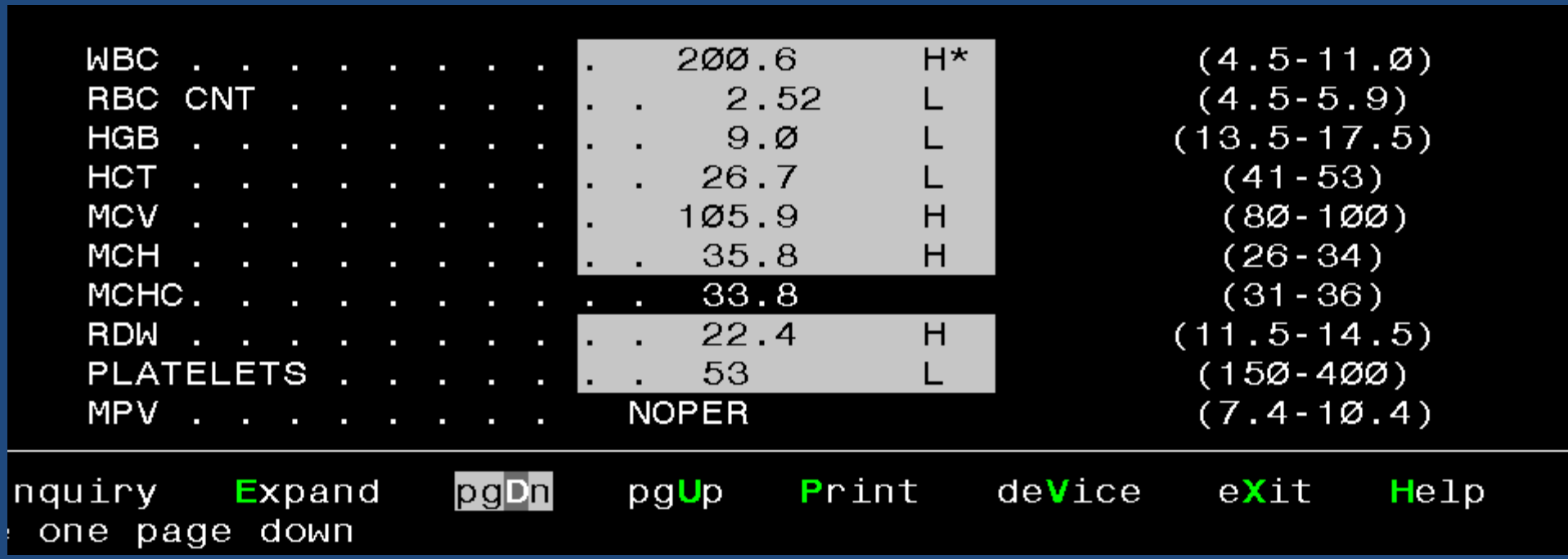


CML

- Usually asymptomatic
- Most common presentation is abnormal CBC
- Usually not an emergency

- Rapid referral → all patients - due to need to start Imatinib. A once-a-day wonder pill that puts the majority of folks into long term remission

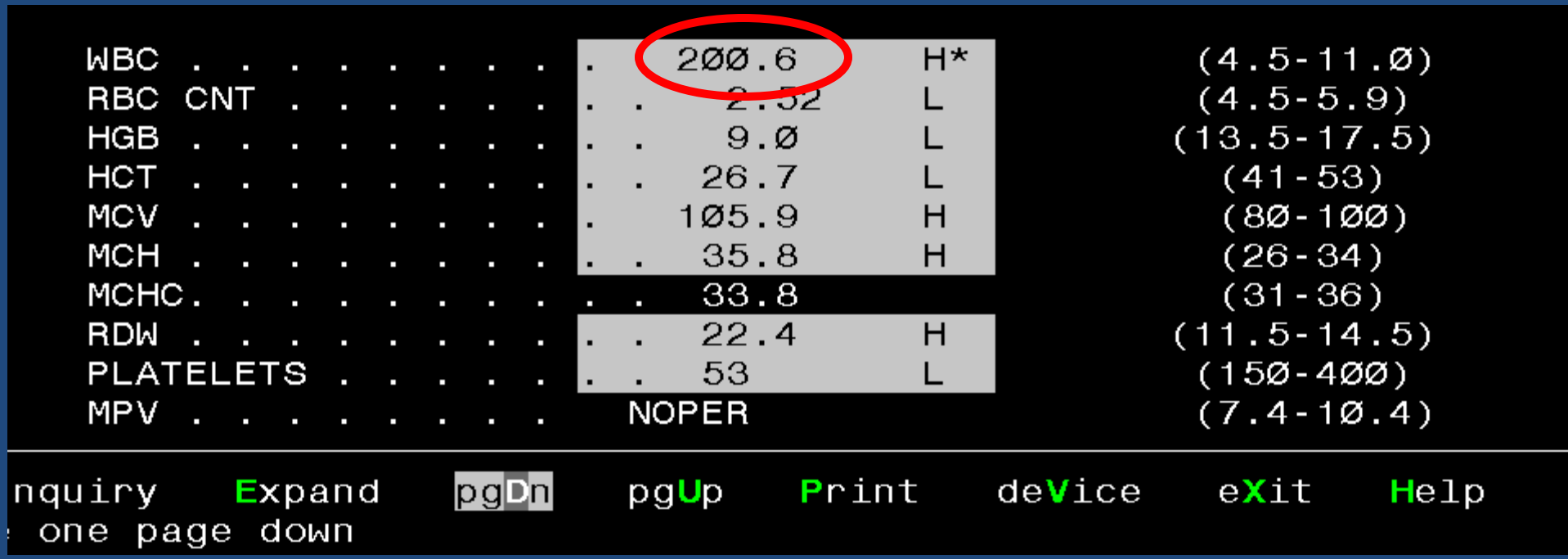
More serious stuff, though this young airman just complained he could only run his mile and a half in 9 minutes…



Very High WBC, Anemia and low PLTs

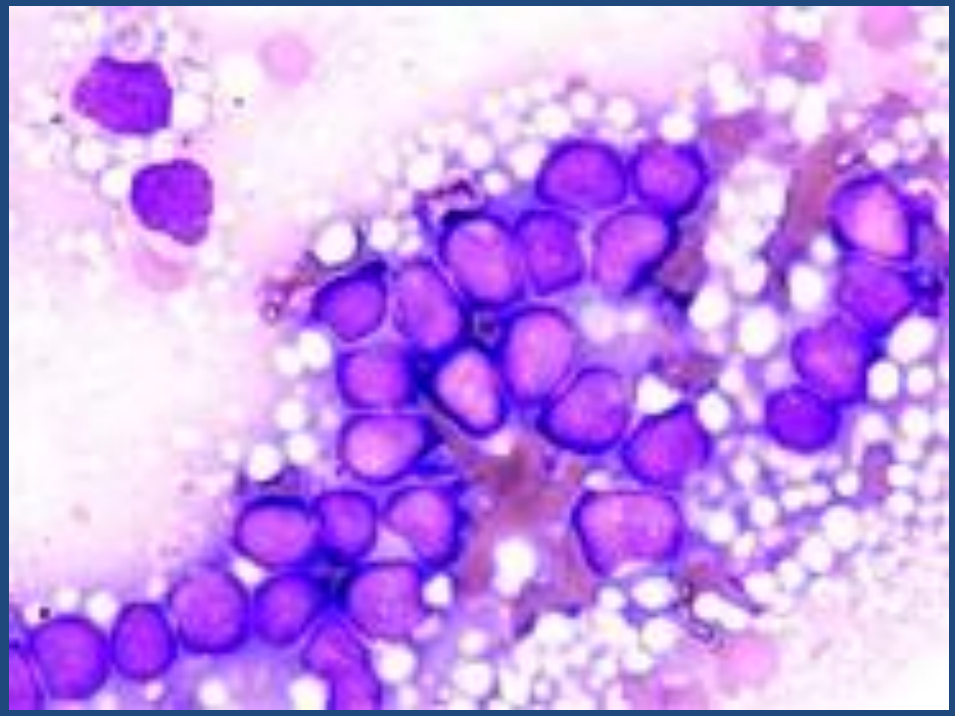
Acute Leukemia until proven otherwise

This is a big emergency



Acute leukemia in adults

- Still less than 50% cure rate
- Commonly require a bone marrow transplant
- Immediate referral and admission

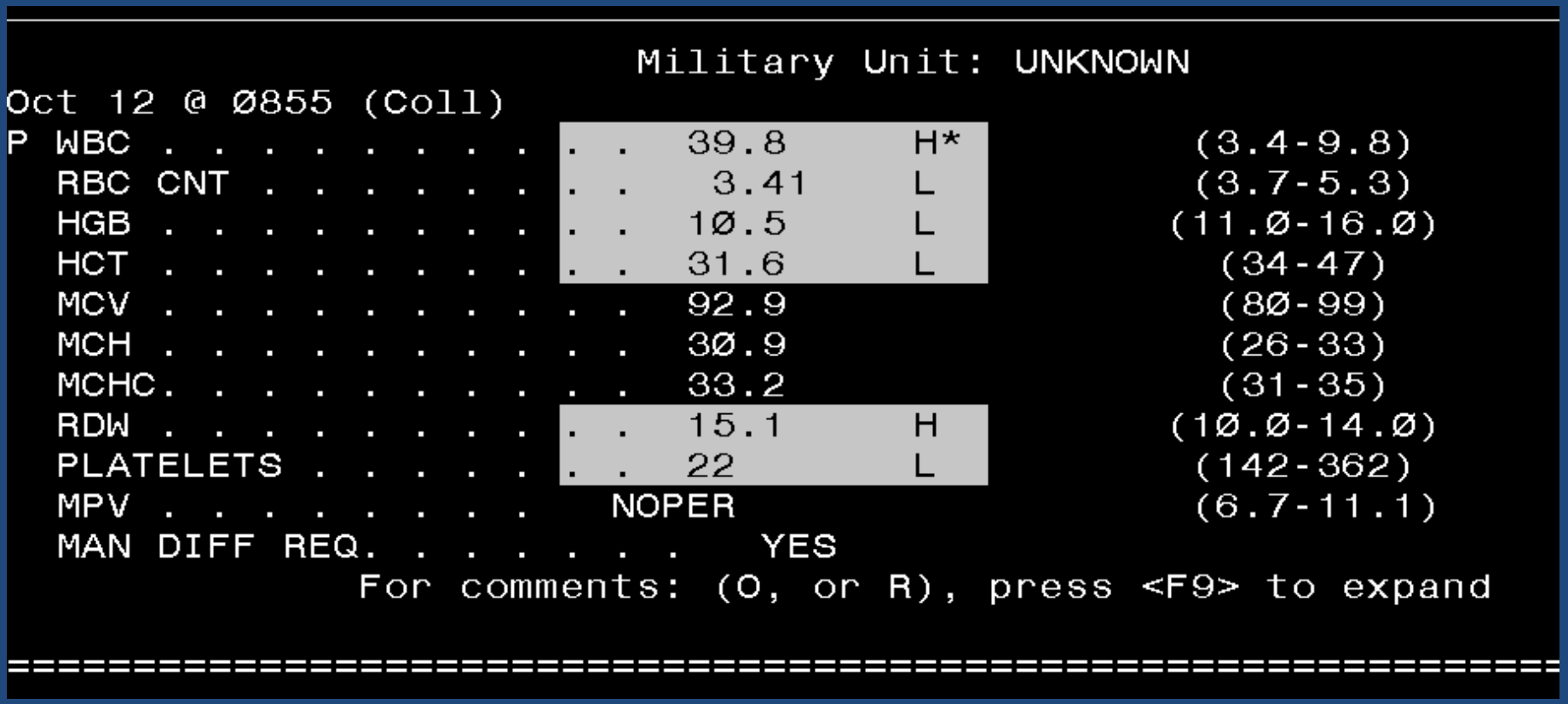


Summary

- CBCs are among the most common tests used in health care
- Recognizing serious from benign problems can facilitate appropriate referrals and/or calm anxieties regarding abnormalities.
- Please feel free to contact us in Hematology for any questions. (210) 916-4808
- michael.osswald@amedd.army.mil

Common CBC abnormalities

- WBCs
  - Too high
  - Too low
  - Abnormal differential
- Platelets
  - Too low
  - Too high
  - Too big
- RBCs
  - Too high
  - Too low
  - Too big
  - Too small

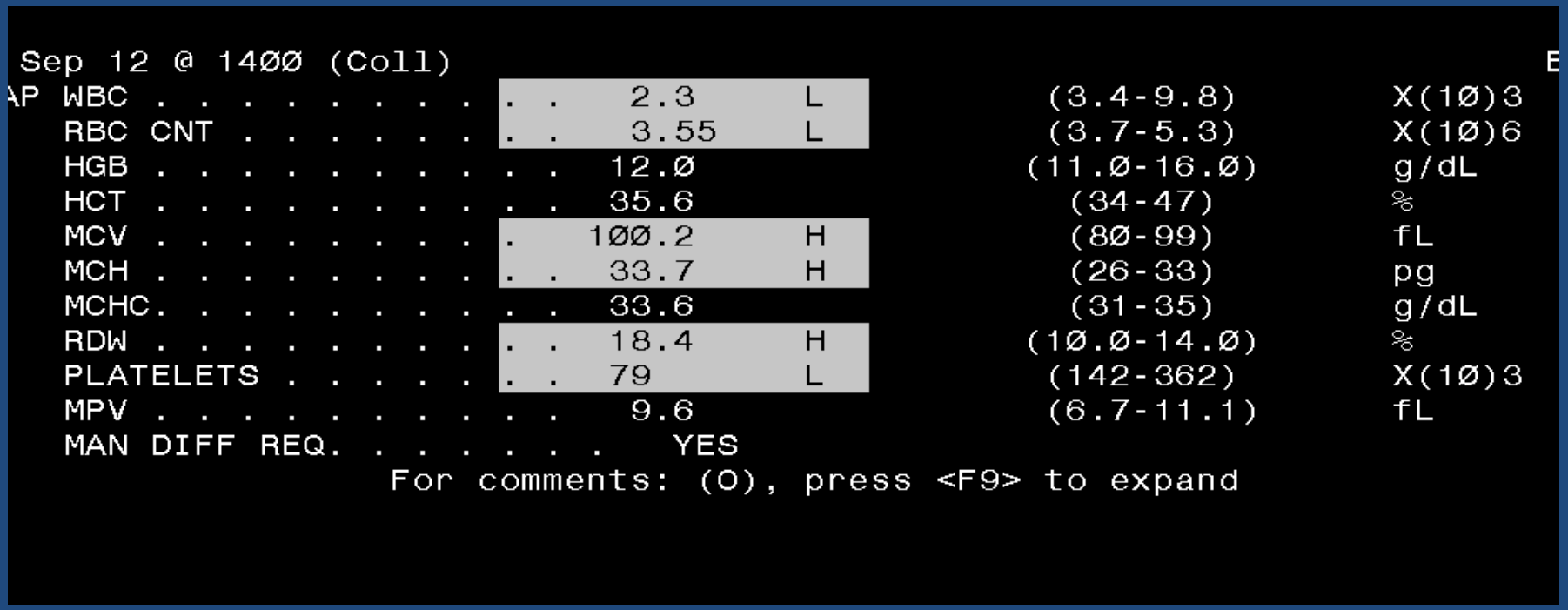

Military Unit: UNKNOWN
Oct 12 @ Ø855 (Coll)
P WBC . . . . . 39.8 H* (3.4-9.8)
RBC CNT . . . . . 3.41 L (3.7-5.3)
HGB . . . . . 1Ø.5 L (11.Ø-16.Ø)
HCT . . . . . 31.6 L (34-47)
MCV 92.9 (8Ø-99)
MCH 3Ø.9 (26-33)
MCHC. 33.2 (31-35)
RDW . . . . . 15.1 H (1Ø.Ø-14.Ø)
PLATELETS . . . . . 22 L (142-362)
MPV . . . . . NOPER (6.7-11.1)
MAN DIFF REQ. . . . . YES
For comments: (O, or R), press <F9> to expand

Severe pancytopenia

WBC	Ø.5	L*	(3.4-9.8)
RBC CNT	2.3Ø	L	(4.5-5.9)
HGB	7.5	L	(14.Ø-18.Ø)
HCT	21.5	L	(41-52)
MCV	93.4		(83-98)
MCH	32.8		(28-33)
MCHC	35.1		(31-36)
RDW	17.3	H	(1Ø.Ø-14.Ø)
PLATELETS	25	L	(142-362)
MPV	7.6		(6.7-11.1)
MAN DIFF REQ.	YES		

For comments: (R), press <F9> to expand

Mild pancytopenia, slt Inc MCV



Sep 12 @ 1400 (Coll)

WBC	2.3	L	(3.4-9.8)	X(10)3
RBC CNT	3.55	L	(3.7-5.3)	X(10)6
HGB	12.0		(11.0-16.0)	g/dL
HCT	35.6		(34-47)	%
MCV	100.2	H	(80-99)	fL
MCH	33.7	H	(26-33)	pg
MCHC	33.6		(31-35)	g/dL
RDW	18.4	H	(10.0-14.0)	%
PLATELETS	79	L	(142-362)	X(10)3
MPV	9.6		(6.7-11.1)	fL
MAN DIFF REQ.	YES			

For comments: (O), press <F9> to expand

High RDW, sidero

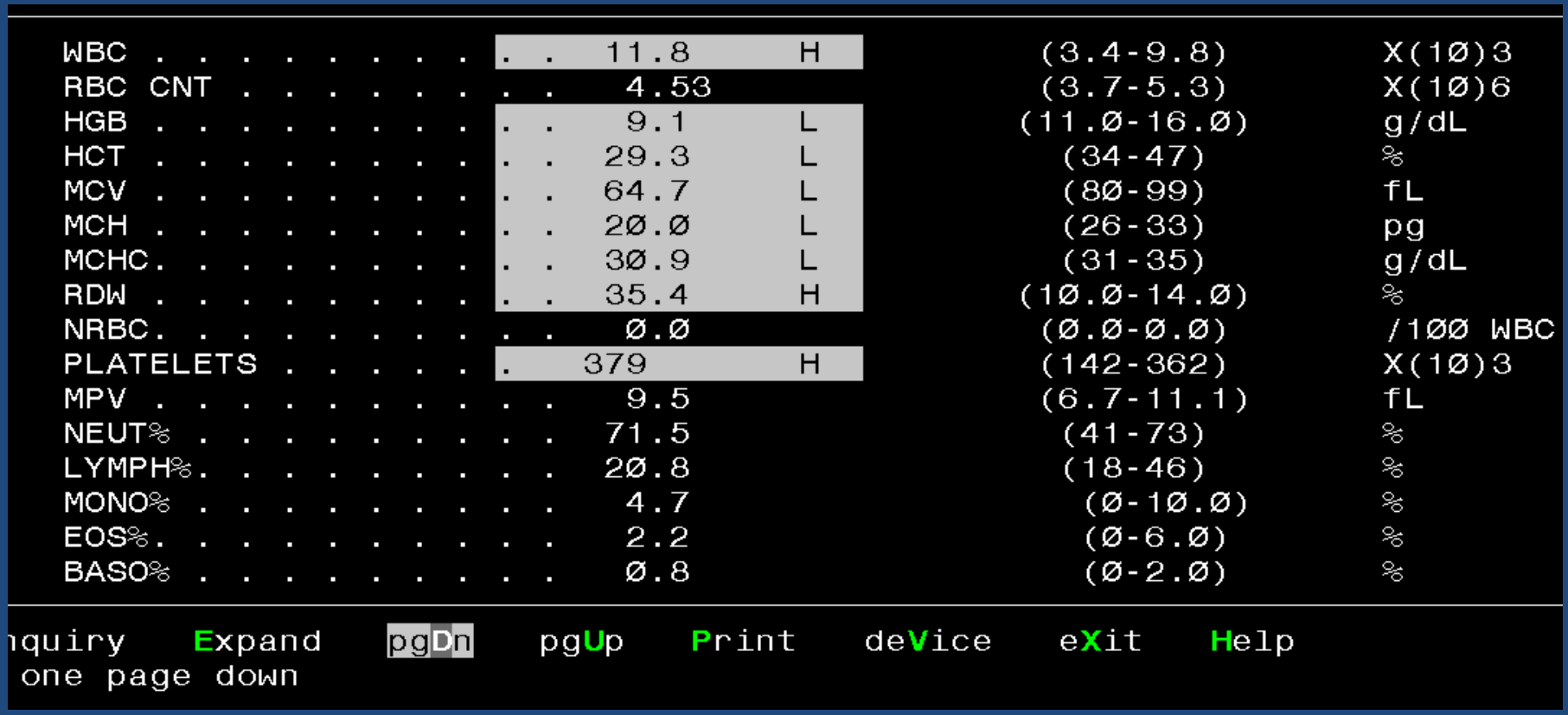
May 99 @ 1412 (Coll) BLC

CBC:WBC	10.0		(4.8-10.8)	X(10)3
RBC CNT	4.22		(4.2-5.4)	X(10)6
HGB	11.6	L	(12.0-16.0)	G/DL
HCT	35.6	L	(37.0-47.0)	%
MCV	84.2		(81.0-99.0)	FL
MCH	27.5		(27.0-31.0)	PG
MCHC.	32.7	L	(33.0-37.0)	G/DL
RDW	23.9	H	(11.5-14.5)	%
PLATELETS	448.0	H	(130-400)	X(10)3
MPV	7.6		(7.4-10.4)	fL
NEUT%	51.4		(37.0-73.0)	%
LYMPH%.	33.2		(20.5-51.1)	%
MONO%	11.4	H	(1.7-9.3)	%
EOS%.	3.8		(0-9.0)	%
BASO%	0.2		(0-2.0)	%

nquiry   Expand   pgDn   pgUp   Print   deVice   eXit   Help

one page down

High RDW, low MCV, anemia



WBC	11.8	H	(3.4-9.8)	X(10)3
RBC CNT	4.53		(3.7-5.3)	X(10)6
HGB	9.1	L	(11.0-16.0)	g/dL
HCT	29.3	L	(34-47)	%
MCV	64.7	L	(80-99)	fL
MCH	20.0	L	(26-33)	pg
MCHC	30.9	L	(31-35)	g/dL
RDW	35.4	H	(10.0-14.0)	%
NRBC	0.0		(0.0-0.0)	/100 WBC
PLATELETS	379	H	(142-362)	X(10)3
MPV	9.5		(6.7-11.1)	fL
NEUT%	71.5		(41-73)	%
LYMPH%	20.8		(18-46)	%
MONO%	4.7		(0-10.0)	%
EOS%	2.2		(0-6.0)	%
BASO%	0.8		(0-2.0)	%